Forum NIL

Nachhaltigkeit im Lebensmittelhandel

Sustainability in Food Retailing

An Evaluation of Sustainable Consumption in the German Meat Market

Jana Voth

Cologne University of Applied Sciences

Faculty of Business, Economics and Law

NIL Research Paper 1/2015

Fachhochschule Köln
Cologne University of Applied Sciences

Schmalenbach School of Business and Economics

Hochschule
Bonn-Rhein-Sieg
University of Applied Sciences

IZNE Internationales Zentrum
für Nachhaltige Entwicklung
International Centre for
Sustainable Development

Table of Contents

Authors and Contact Persons

This paper is part of the Forum **N**achhaltigkeit **i**m **L**ebensmittelhandel (NIL; Sustainability in Food Retailing) which is a collection of scientific papers dealing with various aspects of sustainability in the area of food retail trade. For further information on the Forum NIL, the publishers, Prof. Dr. Manfred Kiy (Cologne University of Applied Sciences) and Prof. Dr. Wiltrud Terlau (Bonn-Rhein-Sieg University of Applied Sciences), can be contacted. The respective authors are responsible for the content of their own texts.

Author

Jana Voth, Cologne University of Applied Sciences

Contact Persons

Prof. Dr. Manfred Kiy

Cologne University of Applied Sciences

Faculty of Business, Economics and Law

Tel.: +49 221 8275 3432

E-Mail: manfred.kiy@fh-koeln.de

Prof. Dr. Wiltrud Terlau

Bonn-Rhein-Sieg
University of Applied Sciences

International Centre for Sustainable Development - IZNE

Tel.: +49 2241 865 410

E-Mail: wiltrud.terlau@h-brs.de

List of Figures

List of Tables

List of Abbreviations

€	Euro
10YFP	10 Years Framework of Programmes
AMI	Agrarmarkt Informations-Gesellschaft
BLE	Bundesanstalt für Landwirtschaft und Ernährung
BMEL	Bundesministerium für Ernährung und Landwirtschaft
BMELV	Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz
BÖLN	Bundesprogramm Ökologischer Landbau und andere Formen nachhaltiger Landwirtschaft
BÖLW	Bund Ökologische Lebensmittelwirtschaft
BSE	Bovine Spongiform Encephalopathy
DGE	Deutsche Gesellschaft für Ernährung
e.G.	eingetragene Genossenschaft
EEA	European Environment Agency
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
g	gram
GfK	Gesellschaft für Konsumforschung
GM	genetically modified
GmbH	Gesellschaft mit beschränkter Haftung
IFAD	International Fund for Agricultural Development
JPOI	Johannesburg Plan of Implementation
JRC	Joint Research Centre
kg	kilogram
KG	Kommanditgesellschaft
NRW	Nordrhein-Westfalen
OECD	Organisation for Economic Co-operation and Development
SCP	Sustainable Consumption and Production
t	ton
UN	United Nations
UNEP	United Nations Environment Programme
WBCSD	World Business Council for Sustainable Development
WFP	World Food Programme
WTO	World Trade Organization
WWF	World Wide Fund for Nature

Abstract

The effects of global warming, the depletion of non-renewable resources, the loss of biodiversity and a growing population, has affected nature and humanity over the past decades. Unless we change course in how we produce and consume, severe consequences for life on this Planet in the future are likely to follow. Based on that background, this paper looks at one area of consumption, namely food, and analyses a particular market within this area which causes high environmental pressures, i.e. the meat market.

After having laid the theoretical foundation of sustainable consumption, an overview of the problems arising in the food sector in general and the meat market in particular is given. An in-depth analysis of the consumption of meat in one country, namely Germany, follows. Germany has been chosen as an exemplary for a country showing an excessive consumption of meat. This contributes to the problems linked to the meat market. The past development of the consumption of meat is evaluated and forms the basis for predicting a possible development of meat consumption in Germany until 2025. Based on the findings, conclusions are drawn about a possible trend towards sustainable consumption in the German meat market.

1 Introduction

"We are living as if we have an extra planet at our disposal. We are using 50 per cent more resources than the Earth can provide, and unless we change course that number will grow very fast – by 2030, even two planets will not be enough." (Leape, 2012 cited in World Wide Fund for Nature (WWF), 2012, p. 6)

This quote targets current production and consumption patterns that have a damaging effect on the environment. Currently, we live in "ecological overshoot", occurring when the "ecological footprint[1]" exceeds the Earth's biocapacity (United Nations Environment Programme (UNEP), 2012; Clement, Terlau and Kiy, 2013). If business-as-usual will be continued, it is estimated that 2.3 planets would be needed by 2050. And even though our planet provides everything to live well and within its limits, growing consumption and a growing population without corresponding governmental measures have contributed to the unsustainable society that we face today (World Business Council for Sustainable Development (WBCSD, 2010)).

The degradation of the environment is driven by human behavior and although production and consumption has contributed positively to economic development, it has also led to environmental damage and resource shortages (Schoenheit and Schudak, 2013; UNEP, 2012). The consumption of natural resources has increased to 125% of "global carrying capacity[2]" and could increase to 170% by 2040 (WBCSD, 2008). The worldwide use of fossil fuels has increased 12 fold, the use of ores and industrial minerals 27 fold and of construction minerals even 34 fold from 1900 until 2005. Consumption of biomass has more than tripled within the same period of time (Krausmann, et al., 2009).

An overexploitation of renewable and non-renewable resources, greenhouse gas emissions, the climate crisis, as well as the loss of biodiversity, is the result of today's unsustainable behavior. This has an impact on humanity in areas such as health, education, equity and development (UNEP, 2012). The consumption of industrialized countries has mainly led to these problems with high-income countries being characterized by an increasing ecological footprint per person (United Nations (UN), 2010). The consumption of Western Europeans is

[1] The ecological footprint measures the amount of productive land and water area needed to produce the resources we consume and to absorb the waste this generates (UNEP, 2012). This is done by calculating the land and sea area needed to satisfy human consumption. Since the area available on this planet is restricted, the ecological footprint shows the limits of the Earth and it allows comparing the lifestyle of people from different countries concerning their resource use (Clement, Terlau and Kiy, 2013).

[2] The concept of the carrying capacity is a quantitative concept that assumes limits to the "*capacity of natural ecosystems to support continued growth in resource consumption and pollution*" (Organisation for Economic Co-operation and Development ((OECD), 1997). It is difficult to define those limits and key factors such as population numbers, density and wealth are used. The main focus is on depletion rates of non-renewable and renewable resources and the concentration of pollutants in the environment. The global carrying capacity has been measured with the ecological footprint, yielding an ecological footprint of 2.0 global hectares per person to describe the size of the global carrying capacity. It has, however, been estimated that the average ecological footprint per person is currently 2.2 global hectares (Belz and Bilharz, 2005).

very resource intensive and they have some of the highest consumption expenditures worldwide (UNEP, 2007; UNEP, 2012). This becomes even more vivid, when considering that 86% of the world's total consumption expenditures were realized by only 20% of the world's population in 1998 (UNEP, 2011). It has further been observed that no or only partial inclusion for the use of ecosystem services in the price of a product or service, has contributed to the environmental problems and the mismanagement of natural resources (UNEP, 2007). The environmental degradation driven by human behavior is likely to increase when considering that the world population is estimated to reach 9 billion people by 2050. Forecasts have further predicted that by 2030 the global urban population will double and the middle class is likely to amount to 3.6 billion people. This will lead to more severe stresses on resources (UN, 2010; WBCSD, 2010).

In consideration of the above mentioned facts, the challenge is to decouple economic progress from environmental damage and to raise the living standard of the poor while decreasing the ecological footprint (UN, 2010). Decoupling was defined as an important component of a concept developed over 25 years ago called "sustainable development" (UNEP, 2011). In order to realize the above mentioned decoupling of resource use and economic progress, changes in the way of producing and consuming are, amongst others, needed (UNEP, 2011). The term "sustainable consumption and production" (SCP) evolved, describing a different way of consuming and producing and sustainable consumption became an integral element of sustainable development (UN, 2010). Research over the past years, however, has been pointing out a common problem related to sustainable consumption, which became known as the "attitude behavior gap" (Clement, Kiy and Terlau, 2014). This phenomenon describes a gap between what consumers state about their attitude towards sustainability, in that they see the need for environmental and social standards for products and services, and their actual behavior that does not reflect this attitude (Heidbrink, Schmidt and Ahaus, 2011).

This problem is reflected in this paper by analyzing the consumption of meat in Germany. Since an excessive consumption of meat can be seen as an initiator as well as a driver for many environmental, health and social problems, a reduced consumption of it could help to overcome these problems (European Environment Agency (EEA), 2012; Dusseldorp and Sauter, 2011). The actual consumption of meat in Germany can be said to be excessive, according to a recommendation given by the "Deutsche Gesellschaft für Ernährung" (DGE), which considers health and sustainability aspects (DGE, 2012). An in-depth analysis of the meat consumption in Germany thus serves as an indication for assessing sustainable consumption in the German meat market. Using trend extrapolation, a forecast of meat consumption in Germany until 2025 is made in order to answer the question: "Is there a trend towards sustainable consumption in the German meat market?"

2 Outlining Sustainable Consumption

The topic “sustainability” is very controversial, widely discussed and related to a certain normative perspective and corresponding thinking. What might be sustainable for one person can thus be perceived as being unsustainable by another person. And also sustainable behavior in one area can have negative effects on another area. This might make it difficult to decide on how to behave sustainably. Is it for example “more” sustainable to throw away clothes that are not worn any more or should they be given to people in less developed countries, which could endanger the tailoring in these countries (Reisch and Scherhorn, 1998)? It is therefore crucial to be aware of the complexity of sustainability and to have a common definition of what is understood by sustainability and sustainable consumption. This chapter will shed light on these topics[3].

2.1 Origin of Sustainable Consumption

The discussion on sustainability evolved over 25 years ago, when the Brundtland Commission published their report “Our Common Future” in which it defines sustainable development as: *“development that meets the needs of the present without compromising the ability of future generations to meet their own needs”* (World Commission on Environment and Development, 1987). The Commission further called for action to ensure sustainable development, as the Earth’s ability to support our lifestyles has been exceeded for the past 20 years (WWF, 2006). Out of these endeavors, the United Nations Conference on Environment and Development, also referred to as the Earth Summit, took place in Rio de Janeiro in 1992 (UN, 1997). Several documents concerning e.g. climate change or biological diversity as well as the Agenda 21 were the outcome of this conference. The latter can be seen as a wide-ranging blueprint for sustainable development and calls governments to establish national strategies to facilitate sustainable development (Dodds, Schneeberger and Ullah, 2012).

The importance of production and consumption patterns regarding sustainable development was addressed in the Agenda 21 in the following way: *“the major cause of the continued deterioration of the global environment is the unsustainable pattern of consumption and production, particularly in industrialized countries, which is a matter of grave concern, aggravating poverty and imbalances”* (UN, 1992, p. 18). The Agenda 21 defines two main objectives to overcome this problem:

[3] It should be noted that those who are already familiar with the theory of sustainable consumption can directly go to Chapter 3.

- Consumption and production patterns that put less stress on the environment and facilitate meeting basic needs should be promoted.
- A better understanding of the role of consumption and how to achieve sustainable consumption patterns should be developed.

To achieve these objectives corresponding national policies and strategies need to be put into practice (UN, 1992).

The Earth Summit in Rio de Janeiro was followed by the World Summit on Sustainable Development in Johannesburg in 2002. Sustainable consumption and production was emphasized by the delegations participating at the World Summit as being essential for reaching sustainable development. A working definition of SCP was already provided at the "Oslo Symposium on Sustainable Consumption" in 1994, defining SCP in the following way: *"[SCP is] the use of services and related products, which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations".* (UNEP, 2010, p. 12)

Another important outcome of the World Summit was the Johannesburg Plan of Implementation (JPOI) calling for a "10 Year Framework of Programmes" (10YFP) to be established that would promote SCP to achieve economic development without harming the environment (UNEP, 2011; European Union, 2011).

In the course of the JPOI, many countries have established national plans and programs to promote SCP, often embedding these in their national sustainable development strategies (Schoenheit and Schudak, 2013; European Environmental Bureau, 2014). The German sustainable development strategy "Perspektiven für Deutschland" was established in 2002 and should serve as a basis for political reforms and changing behavior of consumers and businesses. The goals outlined in the strategy should be achieved via various measures and the progress is monitored with the help of an indicator-based system consisting of 21 indicators (Die Bundesregierung, 2014; Clement, Kiy and Terlau, 2014).

In 2012, ten years after the World Summit in Johannesburg, the Rio+20 United Nations Conference on Sustainable Development took place in Rio de Janeiro (EEA, 2012). One of the major outcomes of this Conference was a document named "The Future We Want" which reaffirmed the commitment to sustainable development and recognized the importance of a "green economy[4]", SCP and poverty eradication. Measures to implement sustainable development as well as guidelines on policies for greening the economy have been provided and the 10YFP was adopted (UN, 2012; UN, n.d.).

[4] A green economy is defined as *"one in which environmental, economic and social policies and innovations enable society to use resources efficiently, thereby enhancing human well-being in an inclusive manner, while maintaining the natural systems that sustain us."* (EEA, 2013a, p. 5)

The working definition of SCP as stated above is closely connected to the definition of sustainable development given at the beginning of this chapter. Consumption can thus be defined as being sustainable if it contributes to satisfying today's needs without compromising future generations to satisfy their own needs (Clement, Kiy and Terlau, 2014). Two concepts underlie this definition: sustainable consumption in the broad sense and sustainable consumption in the narrow sense.

Sustainable consumption in the **broad sense** aims at a relative improvement of the status quo by considering social and ecological deficits to then consume in a way that contributes to overcome such deficits while not creating new ones, and without compromising on fulfilling one's own basic needs (Belz and Bilharz, 2005). Buying Fair Trade or organic products, using a hybrid car or reusable bottles are examples for sustainable consumption in the broad sense. The problem is that conflicts between various goals may arise. In the case of organic products, for example, it may be that the production should be resource-efficient and environmentally-friendly, while the product should be affordable for everyone. Therefore, sustainable consumption in the broad sense contributes in relative terms to changing the status quo (Deutscher Bundestag, 2013; Belz and Bilharz, 2007).

Consumption decisions referring to sustainable consumption in the **narrow sense** must be transferable to everyone in an **intragenerational,** as well as an **intergenerational** way without compromising the goal of sustainability. This is very complex as the consumption decisions made must be good for all people on the planet now, i.e. intragenerational, and for future generations, i.e. intergenerational (Deutscher Bundestag, 2013). One attempt to define what is "good" is to measure consumption using a resource-based approach such as the ecological footprint. It should be noted that sustainable consumption in the broad sense and in the narrow sense are not exclusive. All requirements of sustainable consumption in the narrow sense fulfill the requirements of sustainable consumption in the broad sense (Belz and Bilharz, 2007).

To grasp the concept of sustainable consumption as a whole, it is crucial to be aware of important concepts that underlie the defining terms of sustainable consumption, namely concepts linked to sustainability and consumption.

2.2 Concepts underlying Sustainable Consumption

The final state and outcome of sustainable development is **sustainability**, which is a guiding principle that has to be concretized and its meaning may vary depending on the context in which it is used (Schoenheit and Schudak, 2013).

The idea of sustainability in Germany had already originated in the 18th century, when Hans Carl von Carlowitz published his work “Sylvicultura Oeconomica” in which he stated that no more timber should be cut down than can grow back (Carlowitz, 2009). Sustainability was thus approached from an environmental perspective[5] and for many years the concept of sustainability has been used as a synonym for **environmental sustainability**. In the 20th century, the concept was broadened to include an economic and a social perspective. Those three perspectives have since then become a common approach for evaluating the progress towards sustainability (Clement, Kiy and Terlau, 2014). Various conferences held by the UN on environmental topics helped to conceptualize sustainability (Vogt, 2009).

One conceptualization of sustainability, which has found broad acceptance, depicts it in the form of an equilateral triangle with the three perspectives each apportioned to one corner of the triangle, as seen in Figure 1. This reflects the core of sustainability, i.e. an integrative awareness for the entirety and interdependency between the three dimensions. This model of sustainability has been used widely by organizations, governments and also by businesses (Hauff and Kleine, 2009; Pufé, 2012).

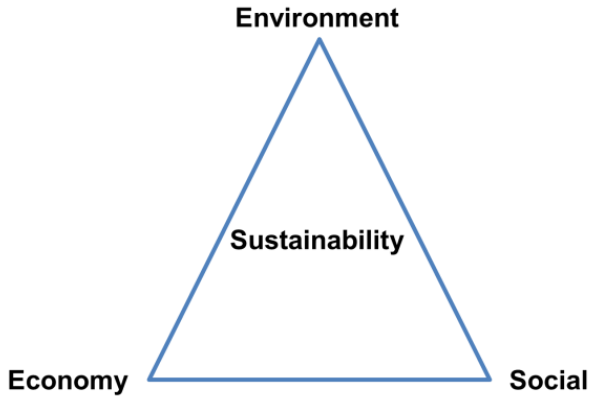

Figure 1: The triangle of sustainability

The three dimensions of sustainability can be described in the following way:

- **Environmental dimension**: Within this dimension, the **conservation of resources** is of major concern, since ecosystems have finite resources and finite capacity (Crane and Matten, 2010). An ecosystem is a source of natural resources benefitting humans directly or indirectly. The European Environment Agency (EEA) names seven different ecosystems: Freshwater, mountain, forest, coastal and marine, agricultural, grassland, and urban ecosystems (EEA, 2010a). Humans depend on functioning ecosystems as they are the life support system of all human activity. Humans thus need to conduct their activities in a way that guarantees the continuity of ecosystems (Pufé, 2012). This

[5] It should be noted that economic considerations are also reflected by the approach of Hans Carl von Carlowitz, as without any timber left, no more profit could be generated (Carlowitz, 2009).

dimension is often seen as the fundamental one or the basis for sustainable development (Kleine, 2009; Piorkowsky, 2001; Wimmer, 2001).

- **Economic dimension**: This dimension evolved on the basis of considerations about a limited economic growth due to the carrying capacity of the Earth. The major focus is to **preserve quality of life over time**. Growth in population and industrial activity could, however, impose a lower standard of living for future generations (Crane and Matten, 2010). A desired quality of life thus requires that livelihood has to be preserved by adapting existing consumption and production patterns accordingly and by organizing the economy in a way to provide wealth and employment in the long-term (Pufé, 2012; Clement, Kiy and Terlau, 2014).
- **Social dimension**: This dimension is primarily concerned with **social justice and equality on a regional, national and global level**. It also entails that each human should be able to live a life in a way that does not question one's self-respect and empowers the person to fulfill his/her potential (Crane and Matten, 2010). This dimension has not been discussed as extensively as the previous two (Schrader and Hansen, 2001). However, it has started to change and the social dimension is put in relation to the other dimensions (Pufé, 2012).

The dimensions are not definitional elements themselves, but they rather represent areas for which specific goals have to be defined and they are seen as mutually dependent (Kleine, 2009). Economic growth can only happen in an intact environment and it is a precondition for social progress (Schrader and Hansen, 2001). In fact, Belz and Bilharz (2007) have argued that sustainability is achieved when all three dimensions overlap, leading to the conceptualization of sustainability in the form of three overlapping circles as depicted in the following figure.

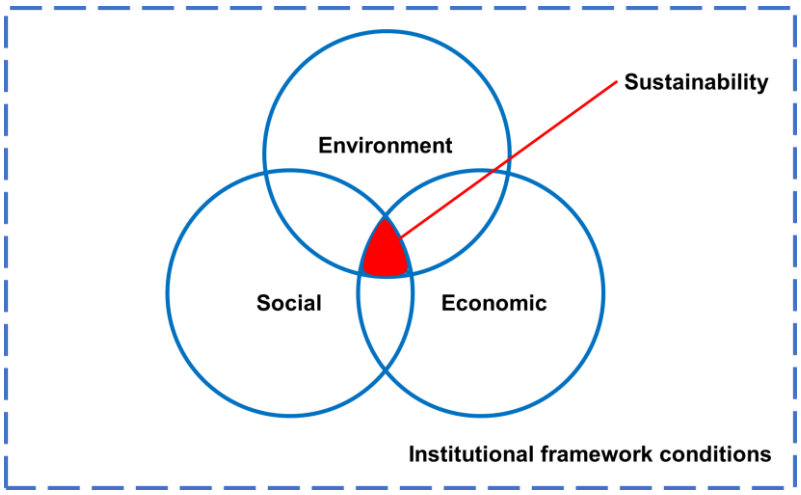

Figure 2: The dimensions of sustainability
Source: Adapted from Belz and Bilharz, 2007

Each dimension is influenced by the **institutional framework conditions**. The composition as well as the importance of the dimensions changes, when these framework conditions change and thus the intersection between the three dimensions also changes. The variation of institutional framework conditions is linked to differing interests that can be attributed to the three dimensions (Belz und Bilharz, 2007). This can lead to conflicts between the goals defined in each dimension and an action conducted to achieve a set goal in one dimension might lead to non-fulfillment of a goal set in another dimension. An example would be the abandonment of brown coal mining (environmental dimension) which would in turn lead to a loss of jobs (social and economic dimension), at least in the short term (Tremmel, 2003). This criticism on the concept of sustainability has often been raised, also because it shows the difficulty in treating all dimensions as equally important.

In practice this problem is often sought to be avoided by stating that only solutions that benefit everyone are strived for with win-win-win situations being the result. Such ideal solutions exist, but are rare and it is more likely that a “trade-off” between the goals set within the dimensions is looked at. It is further recommendable to assign priorities to certain goals in order to give recommendations for implementation (Tremmel, 2003; Hauff and Kleine, 2009).

Generally, there are three strategies that can be used to realize sustainability, i.e. to create an overlap between the three dimensions: The efficiency, consistency and sufficiency strategy (Schoenheit and Schudak, 2013). They are also employed to implement sustainable consumption. The **efficiency strategy** aims at increasing resource efficiency through the use of technology and technical innovation in the area of product design and product use in order to decrease the use of material and energy needed per production unit. The idea is to increase wealth while decreasing the use of resources (Belz and Bilharz, 2007; Grunwald and Kopfmüller, 2012). As such, it should facilitate a decoupling of economic growth and environmental degradation. The problem is that efficiency gains do not necessarily lead to more sustainability, since resource efficiency gains per production unit achieved via technological innovation are often offset or even outstripped by an increased consumption of that product. This phenomenon is referred to as the **rebound effect** (Grunwald and Kopfmüller, 2012; Clement, Kiy and Terlau, 2014).

The **consistency strategy** focuses on qualitative rather than quantitative aspects of resource use by adapting man-made material flows arising from economic activity. The aim is to have closed material cycles in which waste products are used as inputs for new products (Belz and Bilharz, 2007). The adaptation of material flows should happen via a material substitution and the re-organization of processes (Grunwald and Kopfmüller, 2012). Energy, for example, should not be gained from fossil fuels, but from renewable energy sources (Clement, Kiy and Terlau, 2014). The efficiency as well as the consistency strategy mainly aims at increasing

economic growth while decreasing environmental degradation. A major focus is further put on the production of products (Deutscher Bundestag, 2013).

The **sufficiency strategy**, on the contrary, is concerned with consumer behavior and entails an adaptation of existing values and needs as well as lifestyles by asking the question: “How much is enough?” (Belz and Bilharz, 2007). Instead of promoting economic growth, this strategy uses the principle of modesty and self-limitation to achieve sustainability (Grunwald and Kopfmüller, 2012). It is based on the philosophical insight that happiness is not as much related to possessions, but rather to existence (Schoenheit and Schudak, 2013). Thus, the sufficiency strategy postulates to reduce consumption and to promote a lifestyle of post-materialism (Belz and Bilharz, 2007). Examples following a sufficiency strategy would be to refrain from having an own car, but rather share a car with other people or to not have products that consume a lot of energy, e.g. a freezer (Clement, Kiy and Terlau, 2014). Such a lifestyle, however, is not seen as being worth striving for by the majority of the population, partly because people build their identity on what they consume (Belz and Bilharz, 2007). Yet, to achieve sustainability, it has been argued that sufficiency is needed to remain within the limits of this planet and to give considerations to global interests (Deutscher Bundestag, 2013). All three strategies should be combined to help overcome the shortcomings each of them has in order to implement sustainable consumption and to realize the largest amount of potential savings (Belz and Bilharz, 2007; Clement, Kiy and Terlau, 2014).

The concept of sustainability in its various facets has been outlined above. On the one hand, sustainability functions as a normative concept or an abstract vision aiming to satisfy the needs of people today without impeding future generations to satisfy their needs. As such, sustainability serves as a point of reference on which many people agree on. On the other hand, sustainability can be seen as a strategic concept, which requires certain goals and measures to be set and implemented. The goal “sustainability” can only be achieved if “sub”-goals are defined for the three dimensions of sustainability and corresponding actions are undertaken (Belz and Bilharz, 2005; Schrader and Hansen, 2001).

In conclusion, it is important to concretize sustainability and to view it in context, as stated at the beginning of this chapter. Since this paper analyzes sustainable consumption, the context in which sustainability is used is consumption. The next part thus deals with consumption, consumer behavior and consumer choices.

Consumption is a complex process influenced by demographics, income and prices, technology, trade, policies and infrastructure as well as by consumer behavior. The role of consumers and factors that influence their buying decisions is important to understand in the context of sustainable consumption and will be characterized in the following section.

A **consumer**[6] is a person that receives goods and services for personal use. Consumers are furthermore citizens and thus indirectly influence institutional framework conditions via the election of politicians and political parties (Eckert, Karg and Zängler, 2007). An individual can thus influence sustainable consumption via his purchase decisions and in his role as a citizen (Clement, Kiy and Terlau, 2014).

Environmental pressures are not only caused by production, but also within all phases of consumption, i.e. the preemption, the purchase and the post purchase phase (Wimmer, 2001). This can be reflected by the life cycle assessment of a product, which shows the true cost of what is produced and bought (Deutscher Bundestag, 2013; Strange and Bayley, 2008). Since consumption and production are mutually dependent, consumers can not only contribute to reducing environmental pressures by how they use products, but also by their purchasing decisions (Schrader and Hansen, 2001; Clement, Kiy and Terlau, 2014). A change of consumer preferences can further influence the products offered. Thus, consumers can directly or indirectly influence sustainable development (Eckert, Karg and Zängler, 2007). At the same time, supply also influences consumer behavior (König, 2013; Deutscher Bundestag, 2013).

Consumer behavior, reflected by consumer's purchase decisions, is affected by the following factors (Kotler, et al., 2011):

- **Cultural factors:** These factors influence consumer behavior externally by being part of a certain culture, sub-culture or social class.
- **Social factors:** Groups, the family as well as one's role and status have an impact on the choices of consumers by putting expectations on the consumer or via transmitting certain lifestyles or behavioral patterns.
- **Personal factors:** This set of factors includes the consumer's age and stage of life, his profession, financial situation, lifestyle, personality and self-perception. All of these factors change during a person's life and can be used to group consumers.
- **Psychological factors:** Attributes belonging to this group cannot be seen easily from the outside and include motivation, perception, learning, convictions and attitudes. These factors play a very important role concerning sustainable consumption, as they determine directly if and to what extent the consumer considers sustainability aspects when purchasing a product (Wimmer, 2001).

All factors need to be regarded when talking about consumer choices as they directly influence what consumers buy and they are helpful for predicting consumer behavior. Consumers are further influenced by the situation of the purchase as well as by incentives (Clement, Kiy and Terlau, 2014). Considering the factors influencing consumers and by using the aspects of

[6] Due to simplicity only the male form is used, but it includes male and female persons.

sustainability as outlined above, helps defining a **"responsible consumer"** by means of certain characteristics. Grouping consumers via the allocation of certain attributes is a common tool used in marketing and by organizations (Kotler, et al., 2011). The Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz (BMELV) has, for example, used it to define three types of consumers, i.e. the confident, the vulnerable and the responsible consumers, in order to adapt its policies on consumer protection accordingly (Micklitz, et al., 2010). Within the scope of this paper, a responsible consumer is defined by the following attributes:

- He is aware of his responsibility for the environment, his neighbors and himself – for present and future generations (Balderjahn, 2013; Verbraucherzentrale Nordrhein-Westalen (NRW), 2014; Ahaus, Heidbrink and Schmidt, 2011).
- He spends comparably more resources, such as time and money, when consuming. For example, by looking for labels that give certain information on a product and a willingness to pay a higher price for such products (Verbraucherzentrale NRW, 2014).
- He is reflective in his purchasing decisions, considering the effects of his consumption on the environment, on the society and on himself and acting accordingly (Clement, Kiy and Terlau, 2014). This implies a reduced consumption of products being harmful to the environment, a behavior that preserves resources and the purchase of those products that use fewer resources (Tully, 2012; Deutscher Bundestag, 2013; Ahaus, Heidbrink and Schmidt, 2011).
- He is informed about the problems arising out of his consumption decisions and he is able to process and evaluate information received via the media accordingly (Verbraucherzentrale NRW, 2014).
- He is actively participating in political matters by e.g. participating in elections, thus influencing the institutional framework conditions. He shows civic engagement, e.g. by participating in protests on environmental topics. In that way, institutional framework conditions and incentives counteracting sustainable development can be pointed out and changed (Ahaus, Heidbrink and Schmidt, 2011; Heidbrink, Schmidt and Ahaus, 2011).

It should be noted that these characteristics describe an ideal, which is used as a benchmark or an orientation for evaluating sustainable consumer behavior within this paper. They further build the basis for the following definition of sustainable consumption used in this paper.

Sustainable consumption is defined by a consumer behavior that shows awareness for the implications on the environment, the economy and society, arising out of one's consumer choices (Deutscher Bundestag, 2013). A consumer behavior is said to be sustainable, if it does not cause irreparable harm to the environment and regards environmental limits. This resource-based approach is taken, as reaching certain environmental limits can often be seen

by the rise of socio-economic problems beforehand. Rising petrol prices, for example, can reflect a shortage of oil. Or the fact that fishermen do not catch fish can be attributed to a decreasing fish stock (Belz and Bilharz, 2005). The environmental dimension of sustainability thus builds the basis and it is a prerequisite for realizing goals set in the economic and social dimension. Consumers consuming sustainably reduce the consumption of environmentally harmful products, thus following a sufficiency strategy, and purchase those products that have been produced in a resource-efficient manner (efficiency strategy) or contribute to preserving resources, i.e. the purchase of sustainable products (Belz and Pobisch, 2005). For example, a reduced consumption of meat, the shared use of a vehicle, or improving the insulation of one's house, reflect a sustainable consumer behavior and show the implementation of those two strategies (Weber, 2001). A specific focus on the environmental dimension has further been chosen, since consumption relating to animal welfare can be assigned to the environment in the context of sustainable consumption (Clement, Kiy and Terlau, 2014). It should be kept in mind that the institutional framework conditions also influence the environment, the economy and society (Belz and Bilharz, 2007). Thus, when talking about sustainable consumption, government's actions and policies play a crucial role as well. In this paper, however, the main focus is put on consumer behavior.

3 Approaching Sustainable Consumption

Since a resource-based approach is taken to evaluate sustainable consumption, the first step is to look at those areas of consumption that contribute majorly to environmental pressures. Key environmental pressures caused by private consumption in the European Union can be attributed to the area of food, mobility as well as housing (EEA, 2012; Commission of the European Communities, 2008). These sectors have also been identified as fields of primary concern for action towards sustainable consumption in Germany (Belz and Bilharz, 2005). Within the scope of this paper, only the main issues arising in the area of food will be outlined, as one specific market, namely the meat market in Germany, which forms part of the food sector, is evaluated regarding sustainable consumption.

3.1 Areas of Sustainable Consumption – The Food Sector

When considering the whole food supply chain, it can be seen that the main environmental pressures (negative externalities) arise in the agricultural production and industrial processing (EEA, 2012). Figure 3 depicts the environmental pressures arising along the food and drink value chain graphically.

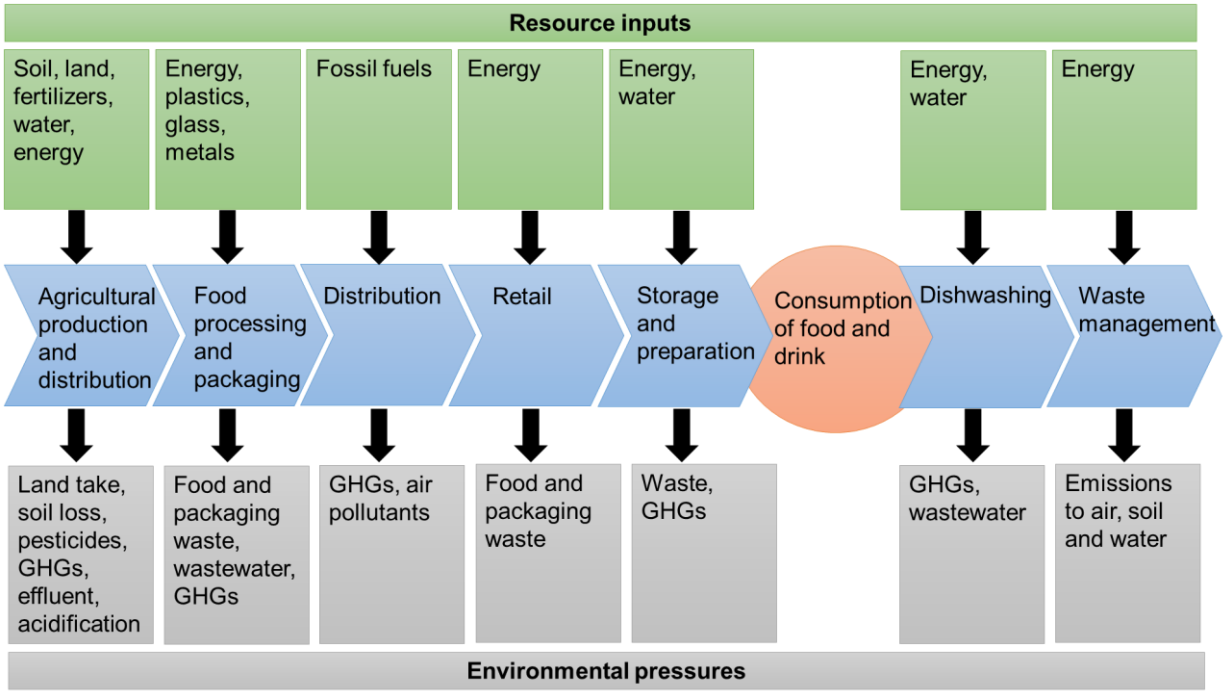

Figure 3: The food and drink value chain and its related environmental impacts
Source: Adapted from EEA, 2012

Within the area of food two main challenges arise regarding sustainable consumption. The first one refers to **feeding a growing world population** that is estimated to reach 9 billion people

by 2050 (UN, 2010). This becomes especially difficult, since global food demand has been exceeding global food supply for the past decade (Humboldt Forum for Food and Agriculture, 2009). The related challenges fall within the broad scope of **food security** (Meyer, Sauter and Kassam, 2011). Further challenges, besides feeding a growing population requiring a **rise of global agricultural production** by 70% from 2005/07 to 2050, arise in the area of food security (Food and Agriculture Organization of the United Nations (FAO), 2012). One challenge is that people, particularly in emerging countries, experience higher incomes and as a result start to **change their eating habits**, adopting a "western" diet. This includes the consumption of more animal products as well as of vegetable oils and processed food which leads to a higher demand for agricultural land and malnutrition (Meyer, Sauter and Kassam, 2011). This "nutrition transition", being discussed since the early 90's, leads to a problem called "double burden", occurring when parts of the population of a country are undernourished, while at the same time, a high amount of people from that country are overweight. This phenomenon is often found in newly industrialized countries like China or Brazil (Dusseldorp and Sauter, 2011).

In literature further problems related to sustainable consumption and food can be found, which are described in this chapter. The agricultural sector will be put under pressure by a **higher demand for biomass** and corresponding bio-economy concepts as well as specifically set bio-fuel targets by governments. This contributes to the conflict between using land for growing food versus using it to produce energy. Currently, 1-2% of the global agricultural land is used for growing bioenergy crop and it is estimated that this could increase up to 12% until 2050 (Meyer, Sauter and Kassam, 2011; Grunwald and Kopfmüller, 2012; Dusseldorp and Sauter, 2011).

In recent years, an **increase of international food prices** puts further pressure on feeding the world's population. It also contributes to another global food crisis, as a higher volatility of agricultural prices can hinder increasing investments in agriculture, possibly resulting in insufficient production in the future (Meyer, Sauter and Kassam, 2011).

Another pressing challenge is the **climate change** to which the agricultural sector is a major contributor. On the other hand, the effects of the climate change on the agricultural sector, i.e. rise in temperature and CO_2 concentration in the atmosphere, water shortages, heat waves and heavy rainfalls and soil erosion, are likely to reduce agricultural productivity, output and incomes (Dusseldorp and Sauter, 2011).

The **degradation of natural resources**, which is stimulated by the disturbance methods of farming, poses a further defiance, particularly to developing countries in the tropical and subtropical areas. It is expected that conflicts over the use of resources are to occur (Meyer, Sauter and Kassam, 2011; Dusseldorp and Sauter, 2011). Water is a major resource for

agricultural production and about 20% of the global arable land is irrigated. This implies that around 70% of the worldwide consumption of freshwater is used for agricultural purposes. In many cases, groundwater is used faster than it can be reproduced (Dusseldorp and Sauter, 2011). This can lead to problems, especially in regions that face water stresses. The concept of the water footprint gives an indication of direct and indirect water usage for a product and helps to assess the impact on water stresses. The production of one kilogram of beef, for example, requires approx. 15,000 liters of water. For the production of one kilogram of cheese or pork around 5,000 liters of water are required, whereas only about 1,000 liter is needed to produce one kilogram of wheat (EEA, 2010b; EEA, 2012).

The last challenge to overcome in order to provide food security worldwide is to **help small-scale farmers** and to improve their farming methods and their socio-cultural organization, as they represent the vast majority of farmers in developing countries. It is estimated that about 100 million small-scale farming families, respectively 500 million people depending on small-scale farming, are situated in developing countries (Meyer, Sauter and Kassam, 2011; Dusseldorp and Sauter, 2011).

Closely connected to the issue of food security is a second main challenge regarding food and sustainable consumption, which is to **distribute the available food equally among the world's population (food equity)**. Currently, people in many developing countries are faced with extreme hunger, while food is being wasted in developed countries due to an excess of food. **Undernourishment** in developing countries leads to illness, disabilities and death. Between 2010 and 2012, about 850 million people were undernourished in developing countries (FAO, World Food Programme (WFP) and International Fund for Agricultural Development (IFAD), 2012).

On the other hand, excessive provision of food and malnutrition in developed countries leads to **overweight and illness**. More than 300 million people worldwide are obese and illnesses like diabetes, some types of cancer and cardiovascular diseases are linked to obesity and can lead to death. In the countries belonging to the Organisation for Economic Co-operation and Development (OECD), over half of the population is overweight, but also in newly industrialized countries, the number of overweight people is increasing. This is partly due to eating habits that entail a high intake of calories, animal products, and processed food coupled with a sedentary lifestyle (Dusseldorp and Sauter, 2011; EEA, 2012).

Another result of the excessive provision of food in industrialized countries is the **loss of food** due to processing, transportation or usage. Food might be wasted because of the exceeded expiration date or people simply throw it away (Grunwald and Kopfmüller, 2012). In Germany, approx. 11 million tons of food is being wasted each year of which the majority (61%) occurs in private households (Kranert, et al., 2012). In developing countries food is also being lost – not

because people throw it away, but rather due to insufficient harvest techniques, inappropriate handling of the harvest, inadequate transportation and storage, and a lack of infrastructure (Dusseldorp and Sauter, 2011).

The availability and transfer of science, technology and knowledge will highly contribute to managing the challenges outlined above. Many analyses on how to best deal with the problem of "feeding the world" have been conducted leading to similar results concerning the status quo and resulting defiance (Meyer, Sauter and Kassam, 2011; Dusseldorp and Sauter, 2011). Another approach to overcome some of these challenges is to adopt a so called sustainable diet, which has been defined by the FAO in the following way: *"Sustainable Diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources."* (FAO, 2012, p. 83)

The production of meat is particularly resource intensive and damaging to the environment, requiring land to raise the animal, water and corn to produce livestock feed and energy for transportation and cooling of the meat (Dusseldorp and Sauter, 2011). Considering the definition of a sustainable diet, a lower consumption of meat and dairy products as well as shifting from beef to pork or chicken[7] can be seen as sustainable, as this would reduce environmental pressures caused by their consumption (EEA, 2012).

3.2 The Role of the Meat Market in Sustainable Consumption

A study conducted on behalf of the Joint Research Center (JRC) of the European Commission points out **environmental problems** arising from the livestock sector. It found that beef, pork and poultry contribute between 5% and 44% of environmental pressures[8] arising out of European private consumption of these products. Furthermore, the environmental impacts differ greatly between the types of slaughtered meat. The environmental impacts of one kilogram of beef are up to five times larger than those of pork and four to eight times higher than those of poultry. When considering the environmental impacts per Euro spend (i.e. environmental impact intensity), pork shows the lowest impact intensity for most environmental impact categories compared to poultry and beef (Weidema et. al., 2008).

[7] It should be noted, however, that the production of chicken and pork requires rich feeds, especially cereal and soybean feeds and thus a shift to those types of meat is only partially beneficial (EEA, 2012).
[8] The impact of each type of meat is different for each environmental impact category assessed. The assessed categories were: acidification, ecotoxicity, eutrophication, global warming, human toxicity, mineral extraction, nature occupation, non-renewable energy, ozone layer depletion, photochemical ozone, respiratory inorganics and respiratory organics. The study also considered dairy products (Weidema et. al., 2008).

The livestock sector has further been found to be one of the major contributors to the **loss of biodiversity** due to its contribution to land degradation, pollution, invasion of alien species, climate change, deforestation of land used for pastures, sedimentation of coastal areas and over-fishing[9] (FAO, 2006). Out of the livestock products, meat requires the highest amounts of resources to be produced (EEA, 2012).

It has further been estimated that producing animal products requires four times as much land as producing crop products with the same nutritional value. This leads to a **loss of arable land** for food production. As a matter of fact, about one third of arable land is used for producing livestock feed. This becomes problematic when the livestock feed is e.g. crop that could be used for feeding the population instead (Dusseldorp and Sauter, 2011).

Another pressing issue related to the meat market is the **excessive use of water**. It has been found that 27% of the water footprint (see Chapter 3.1) of humans is connected to the production of animal products, including dairy products. This is a great proportion, especially when considering that water use at home constitutes only 4% of the water footprint of humanity. In fact, meat and dairy products count to the most water-intensive consumer goods. The problem is that consumers are often not aware of the link between animal products and water use. First, because the biggest portion of the water footprint of the animal products (98%) arises from growing the feed, the first step in the value chain of an animal product. And secondly, the feed is often grown in a region far away from the consumption of the final product, so that the effects are not directly seen by people consuming the product (Hoekstra, 2012).

Raising cattle leads to increased levels of methane gas, contributing to climate change, as it heats up the atmosphere 20 times as much as CO_2 emissions, thus contributing to environmental problems. In fact, animal breeding is contributing 18% to the total **global warming** effect, which is more than the contribution of the global transportation sector (Dusseldorp and Sauter, 2011; FAO, 2006).

Due to the high amount of soy needed for animal feed, rainforests in the Amazon are being destroyed, contributing to **climate change**. The problem is that soy is the major supplier of protein in animal feed and in the EU there is not enough land to produce all the soy needed for meat production (Chemnitz, 2013). Soy, produced in countries like Brazil, Argentina or the United States of America, and used in animal feed in the EU, is often genetically modified (GM) to be resistant against “glyphosate”, which is a certain type of herbicide. The problem is that **glyphosate** is still absorbed by soy and reaches animals via the animal feed, as it is not destroyed by freezing or drying the soy. Humans eating the meat might thus also ingest

[9] It should be noted that in some regions, like in Europe, cattle and sheep farming can have positive effects on biodiversity when done in nutrient poor and upland areas (EEA, 2012, p. 29).

glyphosate and it is very likely that glyphosate increases the risk of cancer, the likelihood of miscarriage and of genetic mutations. But, up to now, no long-term studies have been conducted on the residues of glyphosate in GM soy and human intake of glyphosate (Moldenhauer, 2014; Kalverkamp, 2014).

The “Deutsche Gesellschaft für Ernährung” (DGE) has tested the relationship between the consumption of meat and the **risk of cancer**. They have found that beef, pork and sheep generally pose a higher risk of cancer concerning the alimentary and respiratory organs than poultry does. The relationship between the likelihood of cancer regarding the sexual organs has been found to be weak for all types of meat (DGE, 2012).

Cancer can also be caused by nitrosamines. Fertilizers used for producing animal feedstuff often contain **nitrate**, which could end up in groundwater being taken up by humans. The human body can convert the nitrate to nitrosamines, thus causing cancer. The use of manure on agricultural land is even more damaging than mineral fertilizer as it contains a higher amount of nitrate (Gura, 2013).

Furthermore, residues of **antibiotics** given in mass animal husbandry are also found in groundwater (Kriener, 2013b). The problem is that animals can build bacteria resistant to certain antibiotics given against diseases that humans can also get. These **resistant bacteria**, e.g. resistant salmonella, can become dangerous to human health, if they are ingested via eating the meat of such an animal. Resistant bacteria can further be transmitted across borders via the interlinked global meat industry (Birkel, 2013).

Over the past years, **pathogens** affecting human health have increasingly come from animals or animal products and are transmitted via air-borne dust, ballast water on ships, manure used in agriculture and migrating of wild animals. It has been found that the industrial livestock production increases the likelihood of transmitting pathogens and of pathogens evolution. One reason is that due to industrial livestock production, unfinished animal products are transported across national borders, sometimes several times before reaching the final consumer. Other reasons are the proximity of the confined animals found in industrial livestock production or a low level of personal hygiene, such as no change of clothes by people entering the animal barn. Once an **animal disease** breaks out in an industrial production operation, it is very difficult to contain it and many animals might be slaughtered in order to prevent further outbreak, even if they are not infected themselves (Otte et al., 2007). This was the case for the “Bovine Spongiform Encephalopathy” (BSE), where many cattle were slaughtered (Bartz, 2013). Besides the emergency slaughters, the outbreak of BSE had a further effect.

Producers in the EU only sell chicken breasts to consumers in Europe, as the remaining parts cannot be sold for profit. Before BSE, the rest of the chicken was used to produce carcass meal, fed to animals. This, however, was restricted after the outbreak of BSE and finally

completely prohibited. Producers of chicken in the EU thus searched for new buyers for the "leftover" parts of the chickens, especially after the EU told them that they had to pay for their disposal. Exporters started to buy these parts at nearly no cost to export them to African countries belonging to the World Trade Organization (WTO). This **destroyed the industrial livestock production of chicken in many African countries**, as the chicken parts imported from Europe cost less than two-thirds of the price of a chicken in Africa. Due to this low price – which does not reflect the true cost of producing those chicken parts in the EU – African countries stopped to invest into broiler husbandry. Only a few countries in Africa were able to put restrictions on these imports (Mari, 2013).

Some problems concerning the **industrial livestock production** have already been pointed out above. Further problems related to the industrial livestock production are: First, concerns regarding the welfare of poultry, as perches for the fowl and clean sand are often missing. This implies that the poultry cannot live according to its natural behavior and due to the fast gaining of weight, merely of the pectoral muscle, the poultry can only walk with pain often landing in its own excrement (Benning, 2013).

Secondly, the **loss of diversity of animal species** poses a problem. Only a few breeds are used to provide the majority of meat. Breeds that have been optimally aligned with their natural habitat, which is usually a small-scale mixed-crop livestock system, have been replaced by high-performance breeds for large-scale industrial production systems construed for maximum meat output. These breeds are often the result of hybrid breeding, where various breeds are crossbred until the breed that is finally consumed is obtained. The problem is that genetic resources are being erased and the likelihood of diseases increases when the genetic basis is narrowed down (FAO, 2012; Wetter, 2014).

Thirdly, the intensive livestock farming of meat externalizes costs for species-appropriate husbandry, environmental damages and health risks, failing to reflect the real costs of meat production in the price. This contributes to consumers preferring "conventional" meat over organically produced meat, which is more expensive as the latter reflects the true costs of production to a greater extent (Ahaus, Heidbrink and Schmidt, 2011).

Another problem related to the industrial livestock production is that **workers at slaughtering houses** face health risks due to heat, cold and noise exposure at the working place, high physical strain, especially for joints and the back, a higher risk for infectious diseases, and safety hazards arising from the use of chemicals and dangerous tools (Benning, 2013; Sebastian, 2014).

The increasing **amount of live animal transportations** is also linked to the industrial livestock production (Otte, el al., 2007). The problem is that the length of transportation stresses the animals and regulations for animal transportation are often not regarded, implying that the

animals are given less space than needed. Rules on temperature and duration of breaks are also violated. Furthermore, no restriction on the total duration of the animal transportation is given (Deutscher Tierschutzbund, 2012). The regulations on animal transportation differ for countries not part of the EU and might be worse (Wiedemann, 2014).

Lastly, in the industrial livestock production of pork, **sex hormones are used for sows**, so that they all conceive at the same time. Additional hormones are then given to reduce the time in which the piglets are suckled, from six to three weeks. This reduces production costs and increases output. It also implies that “excessive” piglets (i.e. more piglets that one sow can suckle are born due to the sex hormones) are being killed. The hormones fed to the sows can be directly, i.e. via eating the meat, or indirectly, e.g. via the groundwater, ingested by humans. A higher amount of hormone-active substances found in nature, might be linked to an increasing likelihood of male infertility and an early onset of puberty (Benning, 2014).

Many of the above outlined problems are linked to the changes of the meat market over the past decades, mainly occurring in developed countries. These were:

- increase in livestock populations and densities
- use of fewer, but more productive livestock breeds and lines
- hybrid animals (in the case of pig and poultry) providing the final product
- major changes in the design of animal housing facilities

The reason for these changes is the purpose of a rapid population turnover at one site under controlled conditions. The need for this arose out of countries becoming more affluent thus increasing their demand for animal products. This demand has further been stimulated by public investment (Otte, et al., 2007).

4 Analyzing Sustainable Consumption in Germany – The Meat Market

A decreased consumption of meat could help to overcome the problems outlined in the previous chapter. Since various aspects related to sustainable consumption are reflected by the problems arising in the meat market, it can be used as an indication for sustainable consumption within this market. The DGE has issued a recommendation stating that not more than **300 g to 600 g of meat**[10] **per week** should be consumed in a balanced diet, considering sustainability aspects (DGE, 2012, pp. 37-38).

4.1 Consumption of Meat

In Germany, the consumption of meat increased four times since the middle of the 19th century and doubled compared to 100 years ago with 85% of the German population eating meat nearly on a daily basis (Kriener, 2013a).

Since the beginning of the 1990s, however, the consumption of meat in Germany decreased again. There are three main factors that led to this decrease (Statistisches Bundesamt, 2008):

- increasing prices of meat and meat products
- a change of eating habits towards more vegetables and dairy products
- a series of animal diseases and meat scandals covered by the media

A major reason for the decrease of meat has been BSE occurring between 1996 and 2000. Swine fever in 1994, the hoof-and-mouth disease in 2001 and bird flu in 2005/2006 also affected the consumption of meat (Statistisches Bundesamt, 2008). The “Gammelfleisch” (rotten meat) scandals arising in 2005, where meat was labeled with false ingredients or uneatable meat was sold, has further affected meat consumption in Germany (Bartz, 2013).

The “Gesellschaft für Konsumforschung” (GfK) published a survey conducted in 2012 about the meat market in the EU. The survey was conducted on behalf of the European Commission and 13,477 consumers in the 27-EU Member States were asked about various aspects concerning the meat market. It was supplemented with: a mystery shopping audit of 10,570 products across the EU-27 Member States; stakeholder consultations; and desk research (GfK, 2012a).

For Germany, the survey revealed that meat is mostly bought in supermarkets and discount stores. It further showed that German consumers prioritize different aspects when purchasing meat which are listed below (GfK, 2012b):

[10] This recommendation refers to all types of meat and meat products consumed (DGE, 2012).

- taste (9%)
- abstinence of GM feed (8%)
- freshness of the product (8%)
- hygienic display of the product (8%)
- reasonable price (8%)
- traceability of the product (8%)
- affordable price (7%)
- best before date (6%)
- production in Germany (6%)
- animal welfare certification (5%)
- fulfilment of certain environmental standards (5%)
- habit of buying this certain type of meat (5%)
- organic certification (5%)
- low fat content (4%)
- rebate on the product (4%)
- country of origin being within the EU (2%)
- easiness to prepare the meat (2%)

These factors can be used to explain why a certain type of meat is purchased and they can partially be used to look at why meat in general is purchased, e.g. one can afford to buy meat or one likes the taste of meat.

Over half of the surveyed consumers (59%) would like to buy organic meat more often. Consumers would also buy animal welfare certified (57%) or environment/climate certified (44%) meat more often (GfK, 2012b). But there seems to be an insufficient supply of animal welfare certified meat, as a quarter of the surveyed consumers were not satisfied with the availability of such meat products. This also applies to the supply of environment/climate certified meat, as 26% of the consumers stated that they are not satisfied with the availability of these products (GfK, 2012b).

Taking into consideration the purchase of these meat types in the past month, the survey revealed that 25% of all consumers surveyed in Germany actually bought animal welfare certified meat. This share was even lower for environment/climate certified meat, with only 6% of the consumers buying it in the past month (GfK, 2012b). The lower amount of consumers actually buying certified meat as compared to those who would like to buy it, can partly be explained by the **“attitude behavior gap”** (see Chapter 2). The study generally named price and (a lack of) information as the key factors for explaining this gap between the willingness to purchase sustainable products and the actual behavior. Further research also names limited availability, limited trust in labeling, consumers’ reluctance to take responsibility for their

purchase decisions, or the unawareness of their own responsibility as consumers (GfK, 2012a; Statista, 2014c).

The survey conducted by the GfK further indicated that German consumers mainly purchased pork (83%), followed by chicken (81%), beef (68%) and turkey (62%) in the past month. With 59% of consumers in Germany eating meat at least four times a week, the consumption of meat in Germany is higher than the EU-27 average (43%). But it was also found that 40% of the German consumers would generally like to buy meat less often (GfK, 2012b). This seems to be an indication that German consumers are willing to cut down their consumption of meat.

In 2012, the DGE published its findings on the consumption of meat by the German population. Between November 2005 and January 2007 they asked 19,329 consumers between 14 and 80 years about their eating habits. This study is known as the “Nationale Verzehrsstudie II”. On average, men ate 75 g of meat per day and 81 g of meat products per day. Women ate with 42 g of meat per day and 42 g of meat products per day about half of what men consumed. This implies that men were above the recommendation of the DGE, as on average **1,092 g of meat and meat products per person per week** were consumed. Women ate **588 g per week**, which is just below the maximum value of 600 g per person per week (DGE, 2012).

Splitting the participants of the “Nationale Verzehrrstudie II” into people who buy organic products and people who do not, it has been found that women buying organic products are on average within the recommendation of the DGE on meat consumption. Women who do not buy organic products are above the recommendation given by the DGE. Men are in both cases above the recommendation. But men buying organic products consume less meat and meat products compared to men who do not buy organic products (Hoffmann and Spiller, 2010).

The BMELV published information on the consumption of meat and meat products by men and women based on data of the “Nationale Ernährungsmonitor”, a survey conducted by the Max Rubner-Institut on behalf of the BMELV. Each year around 2,000 people that have been participating in the “Nationale Verzehrsstudie II” are asked about their dietary habits (Max Rubner-Institut, n.d.). Based on data collected in 2010/2011, where 1,623 German consumers were asked about their dietary habits, it was found that men consumed on average 159 g of meat and meat products per day. Women only consumed 97 g of meat and meat products per day. Per week this meant that women consumed **679 g on average** and men ate on average **1,113 g of meat and meat products**. Both were thus above the recommendation issued by the DGE (Bundesministerium für Ernährung und Landwirtschaft (BMEL), 2014b). Furthermore, comparing the results obtained by the “Nationale Verzehrsstudie II” and the “Nationale Ernährungmonitor”, the per capita consumption of meat has increased from 2005 to 2011, for

men and women. This could be seen as **counteracting a trend towards sustainable consumption in the German meat market**.

In Figure 4, the development of the consumption of meat per person is depicted from 1950 to 2012. The consumption of meat is measured in two different ways. The first one measures consumption including meat used as food, feed, for industrial utilization and wastage. This is referred to as “general meat consumption”. It is a statistical figure indicating the amount of meat that is available to the German population. The second way to measure meat consumption excludes bones, feed, industrial utilization and wastage and is referred to as “consumption of edible meat”. This figure indicates the actual consumption of meat by humans, as many parts of the animal carcass are not suited for consumption (Deutscher Fleischer-Verband, 2014a). The “general meat consumption” is about 1.5 times higher than the “consumption of edible meat”. The same definition applies in the following chapter when talking about the consumption of beef, pork and poultry. It should be noted that the data for 2012 is estimated and that the data for the “consumption of edible meat” per capita has been taken from the BMEL for the years since 1990. For the time period before 1990, the data was calculated with the average factor of the “consumption of edible meat” per capita from 1990 to 2012, i.e. 1.4770. Furthermore, the data on the consumption of meat from 1950 to 2012 cannot be compared directly as the methods used to compile it changed over the years.

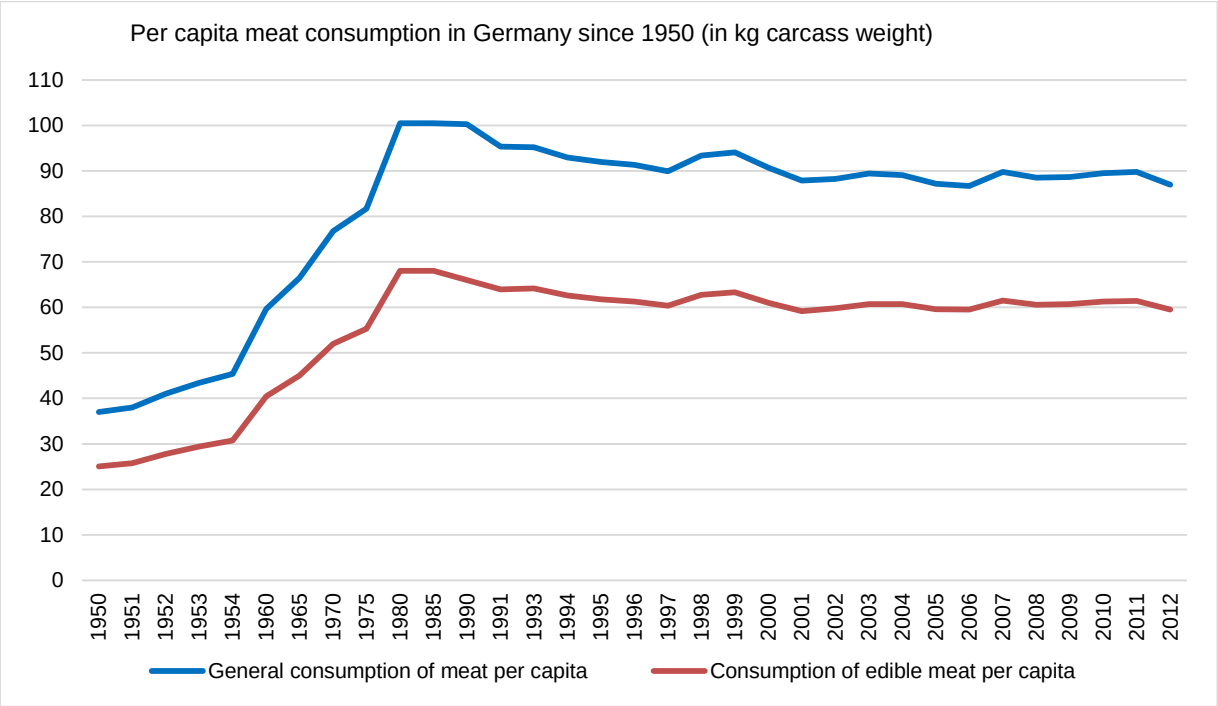

Figure 4: Per capita meat consumption in Germany from 1950 to 2012
Source: Adapted from Bundesministerium für Ernährung, Landwirtschaft und Forsten, 1956; BMEL, 2001; 2005-2012; 2014h

The recommendation of the DGE requests a meat consumption of 300 g to 600 g per person per week, respectively between **15.6 kg to 31.2 kg per person per year**. Figure 4 shows that the “consumption of edible meat” before the 1960s was in line with the recommendation given by the DGE. These were the years after World War II, where consuming meat was a luxury good due to its comparably high price. Since then, the purchasing power of consumers has increased and the prices of meat decreased (Institut der deutschen Wirtschaft, n.d.). In 1970, for example, an industrial worker had to work 115.0 minutes for one kilogram of roast beef, 96.2 minutes for one kilogram of pork chop and 45.8 minutes for one kilogram of frozen broiler. In 2010, the minutes needed to be able to buy one kilogram of the meat types mentioned above have decreased to 35.2, 21.8 and 8.6 minutes, respectively, but slightly increased again until 2012 (BMEL, 2014d). These fluctuations can be seen in Figure above.

The sharp increase of the per capita meat consumption in Germany from 1960 to 1980 is likely to be due to the decreasing price of meat and the increasing purchasing power of consumers in Germany as pointed out above. Since the 1980s the consumption of meat dropped slightly, from 100.5 kg per person in 1980 to 87.0 kg per person in 2012, respectively 68.1 kg per person in 1980 to 60.8 kg per person in 2012. There are several reasons that might explain this decrease:

- changing meat prices with an increase of the prices since 1991 (Statistisches Bundesamt, 2014), but compared to the 1970s and 80s, the prices of food in general are lower and mass production of meat increased its affordability (BMELV, 2009; WWF, n.d.)
- an increasing awareness of problems that meat production causes, especially concerning animal welfare (Heinze and Bundschuh, 2013; Roscher, 2012; OECD/FAO, 2013)
- changing eating habits due to a higher awareness for health issues, which has influenced the consumption of meat more than environmental or animal welfare concerns (Heinze and Bundschuh, 2013; Statistisches Bundesamt, 2008; Cordts, et al., 2013)
- the occurrence of several animal diseases, such as swine fever, BSE, hoof-and-mouth disease and bird flu (Heinze and Bundschuh, 2013, Statistisches Bundesamt, 2008)
- meat scandals being spread over the media, for example the “Gammelfleisch” scandals starting in 2005 (Heinze and Bundschuh, 2013)

Discussions about **animal welfare and health aspects** related to the consumption of meat, have led to the introduction of labels guaranteeing a certain quality. One such label is the so-called “Tierschutzlabel” (animal welfare certificate) introduced by the “Deutsche Tierschutzbund” (German Animal Welfare Federation) in 2013 (Heinze and Bundschuh, 2013). It refers to industrial livestock production of pigs and poultry and certifies that they have been raised and slaughtered according to certain standards of animal protection (Deutscher Tierschutzbund, 2013). In addition, slaughtering companies, such as the Vion Group, Tönnies

Lebensmittel GmbH & Co. KG, or Westfleisch e.G. have started their own programs regarding animal welfare. These programs include better conditions of animal husbandry, optimizing animal transports, improved hygiene in stables and stricter controls of slaughtering (Heinze and Bundschuh, 2013).

Even though the consumption of meat per capita decreased slightly since the 1980s, the "consumption of edible meat" per capita in 2012 was still nearly twice as high as the recommended value by the DGE. Figure 4 further shows that since the end of the 20th century, the per capita consumption of meat has not altered greatly. From 1995 until 2012, the "general meat consumption only decreased by 5.4%, the "consumption of edible meat" decreased even less, namely by 3.7%. Thus, as a first result, there seems to be **no considerable decrease of meat consumption** in Germany over the past 10 to 15 years.

In the further analysis the data on meat consumption in Germany from 1995 to 2012 is used to estimate a future development of the consumption of meat until 2025. It should be noted that for this analysis, only the "general consumption of meat" is taken, since that data has constantly been provided by the BMEL. This also applies to the analysis for the various types of meat in the following chapter. Conclusions drawn from the analysis should be considered with care, as the sample size is relatively small. To conduct the analysis, trend extrapolation using the method of least squares regression is applied. It is assumed that there is a linear relationship between the dependent variable, i.e. the consumption of meat (Y), and the independent variable, i.e. the time variable (t). In mathematical terms this is expressed by the equation:

$$Y = a_0 + a_1 \cdot t$$

Furthermore, normal distribution of the residuals is assumed. To test if the regression model is statistically firm, the following statistical figures are considered:

- **t-value**: With the help of the t-value it can be assessed whether the independent variable has a significant influence on the dependent variable or not. The chosen level of significance of $\alpha = 0.05$.
- **Coefficient of multiple determination (r^2)**: It measures the proportion of the variation in the dependent variable that is explained by the set of independent variables (Berenson, et al., 2009).
- **Durbin-Watson statistic (DW)**: This test is used to measure autocorrelation between the residuals, as one of the assumptions needed for a regression analysis is the independence of errors (Berenson, et al, 2009).

The assumptions and the statistical test dimensions outlined above, are used for the forecast of the consumption of meat in general and apply to all of the following regression analyses

concerning the specific types of meat, i.e. beef, pork and poultry. Furthermore, a dummy variable (d) is used in the regression analysis to account for fluctuations in the consumption of meat. This implies that the equation stated above is modified in the following way:

$$Y = a_0 + a_1 \cdot t + a_2 \cdot d$$

The first regression analysis considers the per capita consumption of meat, taking data from 1995 to 2012. Due to the fluctuation in consumption from 1997 to 1998 and from 1999 to 2000, a dummy variable is used. A possible reason for the increase might have been the recovery of swine fever in the late 1990s and a corresponding increase of consumption. The decrease in 1999/2000 could be related to BSE. Between 1995 and 2012 the per capita meat consumption amounted on average to 89.6 kg carcass weight and decreased by 5.4% over that period. Using the model described above shows a possible development concerning the per capita meat consumption in Germany until 2025, which is depicted in Figure 5. The model is statistically acceptable with the statistical test dimensions shown in the Figure, whereby the values given in brackets represent the t-values of the corresponding independent variables. A more detailed view of the statistical test dimensions can be found in the Appendix. This applies to all of the following regression analyses in this and the following chapter.

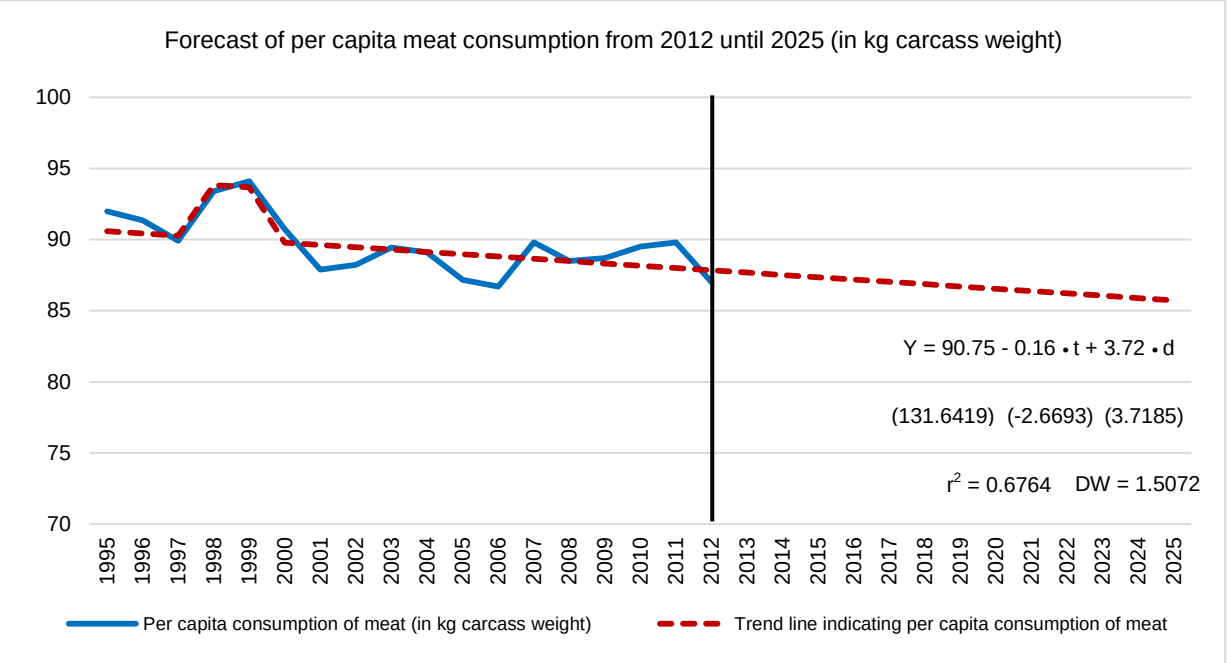

Figure 5: Forecast of per capita meat consumption from 1995 until 2025
Source: Adapted from BMEL, 2001; 2005-2012; 2014h

According to the results obtained by the forecast, the consumption of meat in Germany would amount to 85.7 kg carcass weight per person in 2025. This would represent a decrease of 1.46% compared to 2012.

The data on the per capita consumption of meat in Germany from 1995 to 2012 shows the fairly great variation in the consumption between 1997 and 2001. To account for these changes, the time frame of the regression model is shifted and only data from 2002 until 2012 is used. The t-value of the time variable is 0.1045 and thus smaller than the critical t-value of ±2.2622, implying that the regression model cannot be used.

According to the recommendation given by the DGE, the **consumption of meat should not exceed 31.5 kg per person**. Recalling the regression analysis based on data from 1995 to 2012, a per capita consumption of meat of 85.7 kg was predicted for 2025. This consumption, however, includes bones, feed, industrial utilization and wastage. Dividing the per capita consumption of meat by a factor[11] of 1.4731 indicates the actual consumption of meat by humans. This would amount to **58.2 kg per person in 2025**. This is still twice as much as recommended by the DGE. It can thus be concluded, that the level of meat consumption in Germany is unlikely to decrease to the recommendation given by the DGE. As stated at the beginning of this chapter, this recommendation considers sustainability aspects and it was further argued that a lower level of meat consumption would be in line with sustainable consumption. Bearing this in mind, there seems to be **no trend towards sustainable consumption in Germany** considering the German meat market.

4.2 The Consumption of Beef, Pork and Poultry

In the analysis of sustainable consumption in the German meat market, the consumption of the various types of meat also needs to be considered, as the environmental pressures they cause vary (EEA, 2012). The production of beef generally causes higher environmental pressures than the production of pork and poultry (see Chapter 3). Chicken has further been found to pose a lower risk for certain human diseases as compared to beef or pork (DGE, 2011). A shift in the consumption from beef to pork or chicken could thus be used (to a certain extent[12]), to indicate sustainable consumption in the German meat market. In the following analysis, the same assumptions and statistical test dimensions that applied to the regression analysis of the general consumption of meat apply to the regression analysis of the various types of meat. Figure 6 shows the per capita consumption of the various types of meat from 1995 to 2012. It should be noted that the values for 2012 are estimated.

[11] The factor was obtained by comparing the “general consumption of meat” per person and the “consumption of edible meat” per person from 1995 to 2012. The mean of the differences between those two measures was taken as the factor to convert the “general consumption of meat” to the “consumption of edible meat” or actual consumption of meat by humans.

[12] How beneficial such a shift is depends, amongst others, on the farming methods employed in industrial livestock production of the different types of meat and consideration should also be given to the feed given to the animals (EEA, 2012).

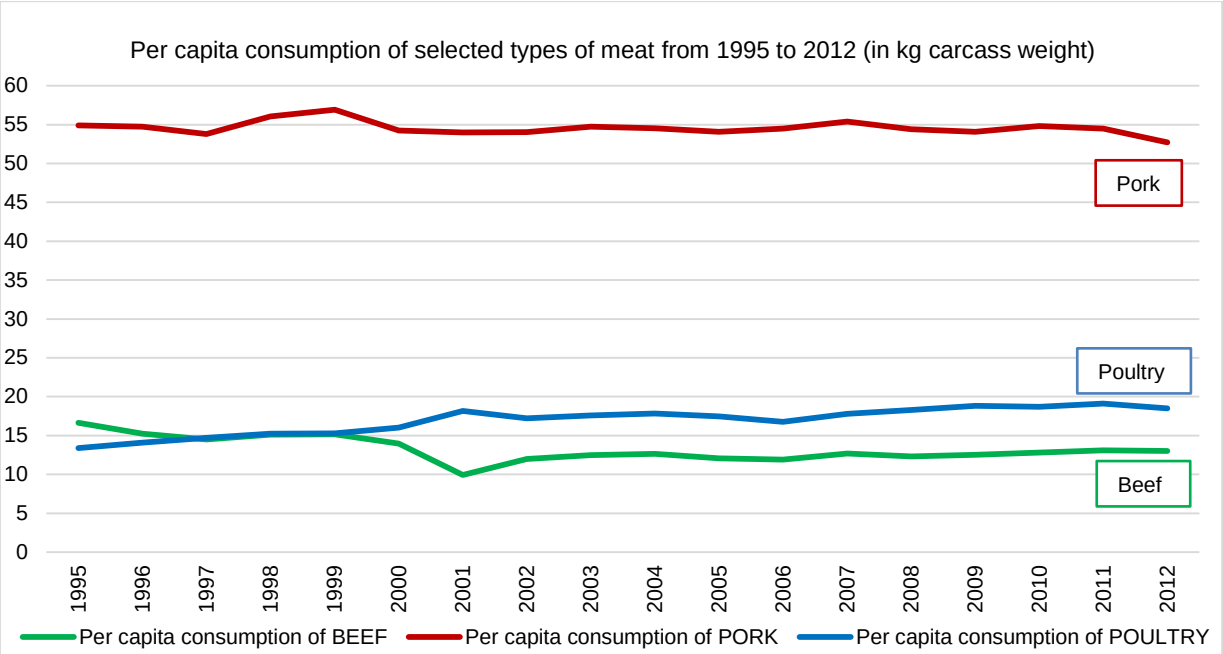

Figure 6: Per capita consumption of selected types of meat from 1995 to 2012
Source: Adapted from BMEL, 2001; 2005-2012; 2014h

The consumption of **beef** dropped from 2000 to 2001 by 28.9% and increased again from 2001 to 2002 by 20.5%. It is very likely that the reason for these changes was BSE, as BSE led to many emergency slaughters of beef around 2000 (Bartz, 2013). In 1996, the British government announced for the first time that people died of Creutzfeldt-Jacob disease, which can be transmitted via the consumption of beef. The cause of BSE has been infectious bone meal being fed to cattle. This bone meal was sold all across Europe. The first case of BSE in Germany was recognized in 2000, and from 2000 to 2001, the consumption of beef dropped a lot as pointed out above (Bartz, 2013; Bundesverband Verbraucherzentrale, 2011). Apart from BSE, the hoof-and-mouth disease could have also contributed to this decrease (Statistisches Bundesamt, 2008).

From 1995 to 2012, the per capita consumption of beef dropped by 27.9%. One reason for the decrease of the per capita beef consumption might have been, apart from BSE, increasing consumer prices. For one kilogram of roast beef, for example, the price increased by 32.6% from 2004 to 2012 (BMEL, 2014c). This could be related to increasing prices of animal feed and operating expenses (Deutscher Fleischer-Verband, 2014b). A portion of these higher production costs might have been passed on to consumers.

Between 1995 and 2012, the mean value of the per capita consumption of beef amounted to 13.2 kg carcass weight and fluctuated quite widely around this value as indicated by the coefficient of variation amounting to 12.08%. In 2012, the majority of cattle being slaughtered (around 60%) were bulls and heifer. Cows made up less than 40% and oxen accounted for less than 1%.

The per capita consumption of **pork** decreased from 1995 to 2012 by 4.0% (see Figure 6), with the largest decrease occurring from 1999 to 2000 (-4.7%). The mean consumption of pork over that period was 54.6 kg carcass weight and it barely fluctuated as the coefficient of variation amounts to 1.66%. One possible explanation for the decreasing consumption of pork from 1999 to 2000 could have been a dioxin scandal in Belgium in 1999. Dioxin was found in animal feed that has been traded within the EU. As a result, dairy products and meat from Belgium was contaminated with dioxin (Bundesverband Verbraucherzentrale, 2011). Belgium was then the second largest exporter of pork to Germany and the EU prohibited exports of meat, including pork, as a result of this scandal. The supply of pork in Germany thus decreased, which might have resulted in a decreasing consumption of pork from 1999 to 2000 (BMEL, 2001; Bundesverband Verbraucherzentrale, 2011). The lower consumption of pork in the following years might have been a reaction to scandals on illegal antibiotics, hormones and vaccine being sold to pig fattening farms in Germany by German veterinarians in 2001. In the same year, the media claimed that producers secretly used water to extend boiled ham and cutlets. In 2002, pigs that have been fed with synthetic hormones were imported and sold in Germany (Bartz, 2013). Another possible explanation for a decreasing consumption of pork could have been an increasing awareness for animal welfare. The increased awareness contributed to the inclusion of animal welfare in the Basic Constitutional Law of Germany in 2002 (Stober and Böhnke, 2015).

Increasing consumer prices of pork could have also affected its consumption since 2000. From 2000 to 2001, the price of one kilogram of pork chop increased from €6.31 to €7.20. The decreasing consumption of pork since 2004 could be related to an increase in consumer prices as well. Taking the prices of pork chops as an example again, an increase of 12.7% from 2004 to 2012 for one kilogram of pork chop could be observed (BMEL, 2014c).

The per capita consumption of **poultry** increased by 38.3% from 1995 to 2012 (see Figure 6). This is quite astonishing, since both the consumption of beef and the consumption of pork decreased over the same period of time. Several reasons help to explain this sharp increase. First, poultry is fairly easy to prepare. Secondly, the awareness for food has changed and positive health aspects (i.e. less fat and more protein) have been attributed to the consumption of poultry. Thirdly, consuming poultry is not connected to any ethical or religious reservations, like it is the case for pork and beef, which are prohibited to eat in certain cultures out of religious motivation. Lastly, poultry is fairly cheap compared to beef and pork, e.g. one kilogram of frozen broiler cost €2.19 in 2012 (Bundschuh and Heinze, 2013; König, 2013; BMEL, 2014c).

Between 2000 and 2001, the per capita consumption of poultry increased by 13.4%. And it decreased by 4.1% from 2005 to 2006. The increase could be a result of BSE with consumers shifting to consuming poultry instead of beef. An advantage of poultry, in particular of broiler, is

that the production can be adapted to an increased demand fairly rapidly. The decrease could have been an outcome of bird flu, which had a worldwide effect on poultry in 2005 and 2006. Compared to the impact BSE had on beef, the effects bird flu had on the consumption of poultry in Germany have quickly been recovered (Bundschuh and Heinze, 2013). From 2006 to 2007, consumption had already increased again by 6.3%.

The fluctuation of the per capita consumption of poultry in the past can also be seen when considering the coefficient of variation amounting to 10.31% for data from 1995 to 2012. For this period of time, the mean value of poultry consumption per person amounted to 16.9 kg carcass weight.

Since 2009, the consumption of poultry in Germany has only been growing slightly and is estimated to decrease slightly in 2012. One major reason for this could be increasing prices of animal feed for poultry and thus rising production costs. Producers might pass on these higher costs to consumers by charging higher prices. But also an increasing discussion about the use of antibiotics in poultry breeding and of animal welfare could have had an impact on the consumption of poultry (Bundschuh and Heinze, 2013). Producers have started to introduce labels, certifying that certain standards such as increased space, a longer fattening period, or special animal feed are fulfilled. Due to the higher production costs resulting from introducing those standards, consumer prices of those products are higher. If a product carrying such a label is not bought, the program is stopped again. So far, products from broilers carrying such a label have been estimated to have gained a market share of about 2% (Bundschuh and Heinze, 2013).

The consumption of poultry itself has further changed from buying a whole animal towards buying parts of the animal. This has affected the production in that a shift has taken place to fattening broiler to gain more weight (hard mast) instead of trying to reduce the fattening period (short mast). The result is that bigger parts of the animal can be achieved, implying that less animals are needed as the meat offtake per animal is bigger (Bundschuh and Heinze, 2013).

Comparing the consumption of beef, pork and poultry (see Figure 6), it can be seen that the consumption of pork is on average about three times as high as the consumption of poultry and beef. Furthermore, there has been a shift from consuming beef to consuming more poultry, as the per capita consumption of poultry has been higher than the per capita consumption of beef since 1997. As pointed out at the beginning of the chapter, a shift from consuming beef to consuming poultry can partly be seen as an indication for sustainable consumption within the German meat market. Considering past data, this shift has happened. Is it likely, however, that it will continue until 2025? To answer this question, a regression analysis of the various types of meat is conducted.

In the first step, data from 1995 to 2012 on the **per capita consumption of beef** is used to conduct a regression analysis. A dummy variable has been added to the model to explain the changes in consumption due to BSE from 2000 to 2002. Figure 7 shows the forecast of per capita beef consumption until 2025 with the statistical test dimensions given in the Figure. The model is statistically acceptable and further information on the statistics be found in the Appendix.

As can be seen in Figure 7, the per capita consumption of beef would decrease by 28.7% compared to 2012, amounting to 9.3 kg carcass weight in 2025. This prediction value, however, should be considered with care due to the results of the Durbin-Watson statistics.

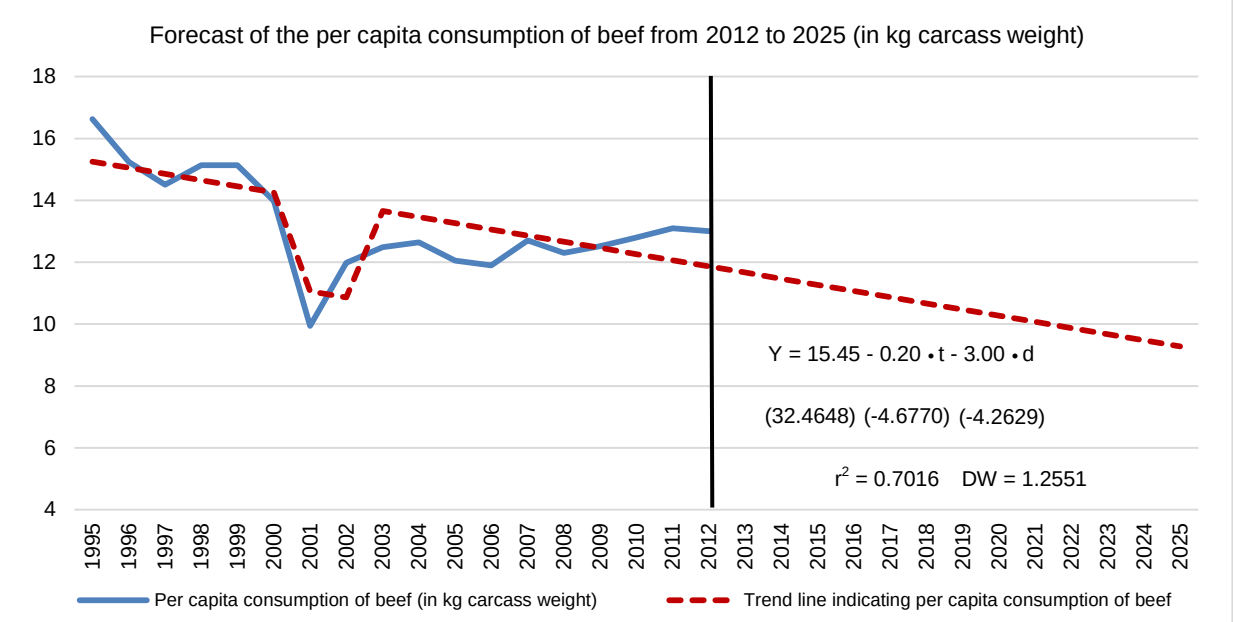

Figure 7: Forecast of per capita beef consumption from 1995 until 2025
Source: Adapted from BMEL, 2001; 2005-2012; 2014h

Due to the outlier in the data in 2001, a new regression model is conducted considering only data from 2002 to 2012 and the time variable as the independent variable. Using this data gives a mean value of the per capita consumption of beef of 12.5 kg carcass weight and a coefficient of variation of 3.08%.

Based on this model, the per capita consumption of beef is estimated to increase by 8.3% compared to 2012, yielding a per capita consumption of 14.0 kg carcass weight in 2025. This is shown in Figure 8. The model is statistically firm, but it should be noted that only a small variation in the per capita consumption of beef can be explained by it.

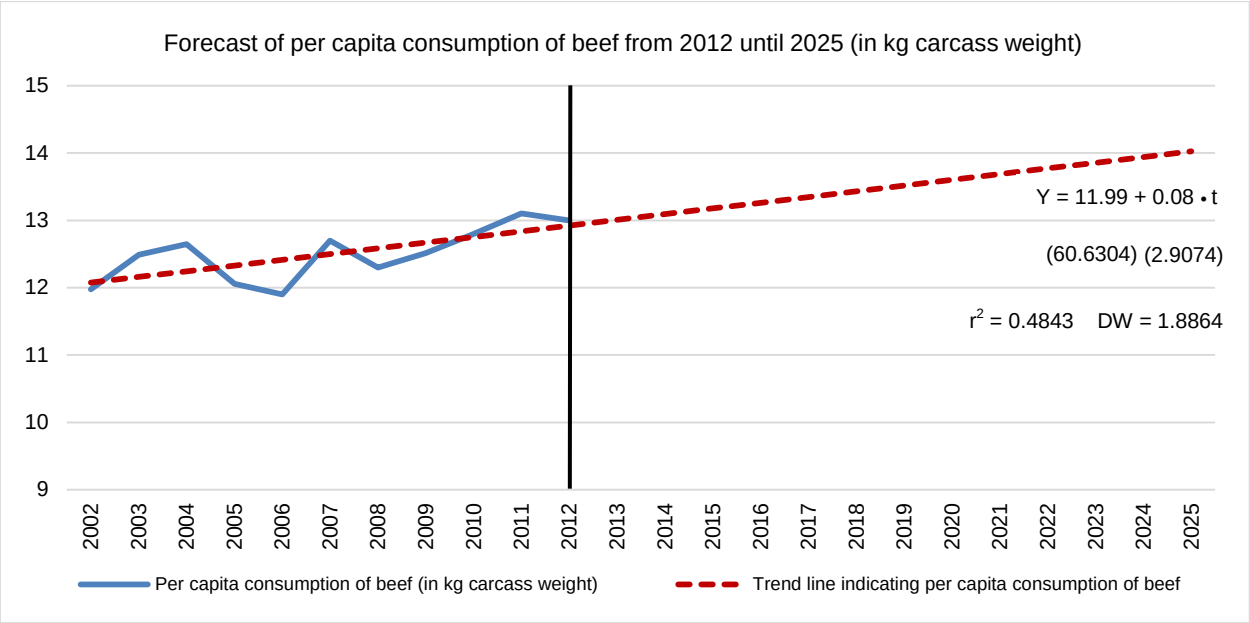

Figure 8: Forecast of per capita beef consumption from 2002 until 2025
Source: Adapted from BMEL, 2001; 2005-2012; 2014h

As pointed out above, only 48.43% of the variation in the per capita consumption of beef can be explained by the independent variable. With the previous regression model based on data from 1995 until 2012 and considering two independent variables, 66.48% of the variation in the per capita consumption of beef could be explained, but the results obtained should be considered carefully. If both models were compared, very different conclusions would be reached. Using the model based on data since 1995, the per capita consumption of beef is predicted to decrease quite strongly, whereas using the regression model based on data since 2002, the per capita consumption of beef is predicted to increase slightly.

What conclusion can be drawn from this analysis? One could come to the conclusion that no prediction can be made about the development of the per capita consumption of beef in Germany, as depending on the basis for conducting a regression analysis, the results obtained are very different. This, could be due to the fact that the method used to conduct the regression analysis, i.e. the method of least squares, is not suitable for this kind of data. Using a different method might therefore deliver reliable results for a possible development of the per capita consumption of beef in Germany. Furthermore, including more factors to explain the variation in the consumption of beef could be useful as pointed out above. Based on the analysis of beef conducted here, **no statement can be made** about a possible development of the consumption of beef until 2025.

Unfortunately, no statement can be made about the **per capita consumption of pork** concerning its development until 2025. This is due to the fact that the t-value of the independent variable(s) considered in this paper, have no significant influence on the per capita consumption of pork. It can only be said that the consumption of pork in the past has

not varied greatly and occurring crisis had a minor effect on its consumption, especially compared to the effects that BSE had on the consumption of beef.

The regression analysis of the future development of the **per capita consumption of poultry** is limited as a regression model based on data from 1995 to 2012 cannot be used, due to a positive autocorrelation of the residuals (DW = 0.9052), which violates the assumption of independence of errors. Instead, a regression model is considered based on data from 2002 until 2012. The time variable and a dummy variable, indicating the effects that bird flu had on the per capita consumption of poultry in 2006 are used as independent variables for explaining the per capita consumption of poultry. The forecast until 2025 is depicted in Figure 9. The model is statistically firm, but due to the small sample size, the results obtained should be considered with care.

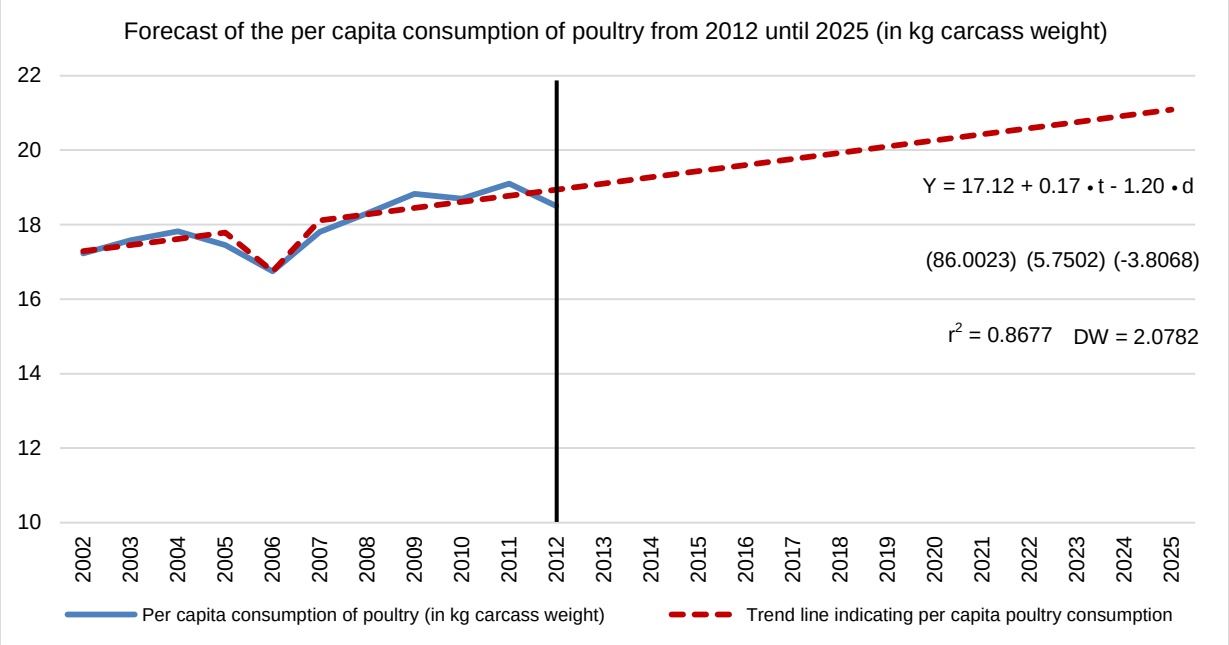

Figure 9: Forecast of per capita poultry consumption from 2002 until 2025
Source: Adapted from BMEL, 2001; 2005-2012; 2014h

According to the forecast, the consumption of poultry per person would increase by 14.0% compared to 2012. This represents a per capita consumption of poultry of 21.1 kg carcass weight in 2025.

Based on the analysis of the per capita consumption of beef, pork and poultry, **no clear statement can be made** concerning a possible shift towards consuming less beef at the expense of consuming more poultry or pork. It has further been found that consuming poultry is less environmentally harmful than consuming pork, as only 1.7 kg of animal feed are required to produce one kilogram of broiler, but 2.9 kg of animal feed are required to produce one kilogram of pork. Thus, consuming broiler is less environmentally harmful as comparably more resources are preserved. But the production of one kilogram of turkey requires 2.7 kg of

animal feed which is nearly as high as that for pork (Bundschuh and Heinze, 2013). Therefore, the type of poultry consumed by Germans also plays a role when talking about sustainable consumption in the meat market. It should be noted that the majority of poultry being slaughtered is broiler, followed by turkey, ducks and cull hens (Statistisches Bundesamt, 2013).

It should further be mentioned that the industrial livestock production of poultry would need to increase if the demand until 2025 would grow as indicated by the forecast based on data since 2002. In traditional production systems the meat offtake per animal only amounts to about one tenth of that achieved by industrial systems, thus the industrial livestock production would need to expand to satisfy an increasing demand (Otte, et al., 2007). This could raise concerns about animal welfare and questions the “real” contribution that shifting to poultry consumption has regarding sustainable consumption. It is thus very difficult to draw conclusions about a possible development of poultry consumption in Germany, especially regarding its role concerning sustainable consumption in the German meat market.

4.3 The Market for Organic Meat

The last part of the analysis is concerned with the market for organic meat, as a higher consumption of organically produced meat could be seen as an indication for a trend towards sustainable consumption in the German meat market. This is due to the fact that organic farming aims at preserving resources by limiting the uptake of nutrients from external sources and by protecting scarce resources, soil and biodiversity (Dusseldorp and Sauter, 2011; EEA, 2012). Organic farming is furthermore dedicated to keeping animals appropriately to their species by, amongst others, limiting the stocking density to the availability of land, feeding the animals by majorly using farm-grown feed and by refraining from the use of antibiotics to a large extent (BMEL, 2014e). As stated in Chapter 2, consuming organic products and thus organic meat forms part of sustainable consumption in the broad sense. A strong focus concerning organic meat is put on the environmental dimension of sustainability as shown above.

Consumers in Germany can recognize organic products by certain labels. The “EU organic logo“, shown on the left side in Figure 10 has to be put on prepackaged food from the EU that is sold as organic since 2010. At least 95% of the product carrying that label must have been produced in line with the requirements for organic farming of the EU. The German “Bio-Siegel“, depicted on the right hand side of Figure 10, can be added voluntarily next to the “EU organic logo” (BMEL, n.d.; Enzler and Cypzirsch, 2012).

Figure 10: National labels certifying organic products in Germany
Source: Adapted from BMEL, 2014e; European Commission, 2014

The "Bio-Siegel" was introduced in 2001 as a national label, being legally based on the German "Öko-Kennzeichengesetz" (Eco-labeling Act) which regards the requirements set by the EU. The label can only be used on products by companies, i.e. producers, processors and importing companies, which fulfill the requirements and agree to regular controls. Producers or processors selling organic products have to report about their resources and produce (BMEL, 2014e).

All companies that want to use the "Bio-Siegel" on their products, have to register at the information agency of the "Bundesanstalt für Landwirtschaft und Ernährung" (BLE) (Federal Agency for Agriculture and Food) in Germany. These companies mainly belong to the processing industry or to commerce. In 2014, 4,397 companies were registered with the BLE to use the "Bio-Siegel" on their products, so that the total amount of products carrying the label amounted to 69,024 by the end of August 2014 (BMEL, 2014a; 2014e). Nearly 4,965 products have been recorded on average each year to the BLE as certified products since 2002. However, for the past two years, the additional products and companies registering per year have decreased compared to previous years (BLE, 2013).

Table 1 gives an overview of the amount of products carrying the "Bio-Siegel" within the various food categories, whereby only the top ten have been chosen. The data refers to 2013.

The top ten food categories according to products carrying the "Bio-Siegel"			
Rank	**Food category**	**Number of products carrying the "Bio-Siegel"**	**Share on total amount of "Bio-Siegel" labeled products**
1	Hot drinks	9,134	13.6%
2	Herbs and spices	7,476	11.1%
3	Bread and pastries	5,896	8.7%
4	Meat and meat products	4,960	7.4%
5	Confectionary and snacks	3,691	5.5%
6	Alcoholic beverages	3,028	4.5%
7	Spread and honey	2,947	4.4%
8	Crop, flour, farina, legumes	2,903	4.3%
9	Non-alcoholic beverages	2,851	4.2%
10	Vegetables, sprouts	2,557	3.8%

Table 1: Overview of organic products carrying the "Bio-Siegel" in 2013
Source: Adapted from BLE, 2013

With a share of 7.4% on the total products with the “Bio-Siegel” being offered in the various food categories, meat ranks 4th and was thus among the top five most important categories for products carrying the “Bio-Siegel” in 2013.

Table 2 gives an overview of the development of organic meat production in Germany from 2008 to 2012. It should be noted that due to the lack of representative reporting systems, organic products are not separately shown in official statistics (Enzler and Schiebel, 2013). Therefore, data published by various organizations, such as the Agrarmarkt Informations-Gesellschaft (AMI), the GfK and the Bund Ökologische Lebensmittelwirtschaft (BÖLW), is used to assess the market for organic meat in Germany.

Development of organic meat production (in t)						
	2008	**2009**	**2010**	**2011**	**2012**	**Annual growth rate from 2008 to 2012**
Beef	35,800	37,700	38,000	39,500	39,200	2.3 %
Pork	21,900	22,900	22,900	23,300	24,200	2.5 %
Poultry	8,870	11,870	11,630	11,480	13,390	10.8 %

Table 2: Organic meat production in Germany from 2008 to 2012
Source: Adapted from BÖLW, 2014

The production has increased for all types of meat from 2008 to 2012. There is one major reason for this increase. Prices of organic meat have, due to an increasing demand, risen, leading to a higher income for producers (BÖLW, 2013). It should be noted, however, that revenues obtained by organic farming are to one quarter attributable to vegetables, fruits and potato. Meat only accounts for about one fifth of the revenues generated by organic farming (BÖLW, 2013). In conventional agriculture, meat accounts for around one third of the revenues generated (BMEL, 2014g).

Another reason for the increase of organic meat production is that the conventional retail industry has increased its demand for organic meat with nearly all retail chains in Germany offering organic meat (Enzler and Schiebel, 2013). But the growth of organic meat in Germany is limited due to the price sensitivity of German consumers. Consumer prices of organic meat are higher than those of conventional meat and an increase could lead to consumers not buying organic meat any more, especially since people who regularly buy organic products tend to consume only small amounts of meat (Enzler and Schiebel, 2013).

It can further be seen in Table 2 that poultry shows, with an average annual growth rate of 10.8% the highest increase in production from 2008 to 2012. But the production of poultry slowed down in 2010 and 2011. A major reason for this was a dioxin scandal in 2010. Organically produced corn has been fed to fowl held on organic farms in Germany. The corn was imported from the Ukraine and reached organic farms in Germany via the Netherlands. Apart from poultry, dioxin had also been found in pork, leading to an interim close down of

4,700 organic farms in Germany (Bundesverband Verbraucherzentrale, 2011; Bartz, 2013). The production of pork had thus also stumbled in 2010 and 2011. Apart from the dioxin scandal, which had the biggest effect on poultry production, a lack of piglets led to a slowdown of the production of pork (BÖLW, 2013). This, and a demand for organic pork in Germany exceeding the supply, has led to importing porker raised on organic farms outside Germany (Enzler and Schiebel, 2013).

Compared to poultry and pork, the production of beef has not slowed down in 2010 and 2011. The main reason could be that beef has not really been affected by the dioxin scandal. So far, there has also not been one case of BSE occurring in cattle being born and raised on an organic farm in Germany (BMEL, 2014e). The higher amount of cattle production compared to pork production is also due to the fact that changing from conventional to organic beef production is useful for farms. First, because it is fairly easy to change grassland to organic farming. Secondly, for farms using fields, the trefoil-grass, which is part of the yearly crop rotation, is eaten by the cattle (Enzler and Schiebel, 2013).

The development of the production of organic meat in the future depends on the profitability of animal keeping, since for the past years there has been a loss, even though producer prices have increased. One reason is that albeit production costs for organic animal keeping are higher than in conventional systems, the prices producer receive for organic meat are not much higher than the prices received in conventional farming (Enzler and Schiebel, 2013). Another major reason for the low profitability of organic animal keeping is an increase of the costs for animal feed and land tenure. Due to a limited amount of land being available to grow animal feed, Germany has been importing animal feed from organic farms outside Germany. Furthermore, conventional protein feed was given, to a limited extent, to the animals, especially for producing pork and poultry. By 2015, however, it is required that pigs and fowl is fed with organically produced animal feed only. This is likely to have an impact on the production of organic meat in Germany (BÖLW, 2013).

Consumers can purchase organic meat via the conventional retail trade, in specialist shops for organic products, or via other sales channels, such as butchers, weekly markets, or directly from the farm. In 2013, the sales of organically produced food in the German food industry amounted to approx. €7.55 billion. This represents a share of 3.7% on the German food market. In 2012, sales of organic products in Germany amounted to €7.04 billion, of which around 50% have been generated via the conventional retail trade. Specialist shops come second with a share of approx. 31% on total sales of organic products in 2012 (BÖLW, 2013). The majority of consumers in Germany buy organic products in supermarkets or discount stores (Statista, 2014a).

The sales of fresh meat and meat products have increased by more than 15%, respectively more than 25%, from 2011 to 2012, which is partly attributable to higher prices (BÖLW, 2013). The sales of red meat increased by 18%, white meat increased by 20% and meat products by 8% over the same period (Enzler and Schiebel, 2013). The decline of meat sales in 2010 due to the dioxin scandal have thus been recovered by a growing demand in the following years.

In 2011, the market share for organic beef as part of the total food category "meat and meat products" amounted to 3.6% that of organic pork to 0.4%, and organic poultry held a share of 0.8% in that food category (Enzler and Schiebel, 2013). It should be noted that due to higher prices of organic meat compared to conventional meat, the share on sales measured in value terms is higher than the one measured in volume terms (Enzler and Schiebel, 2013). Table 3 shows the prices consumers paid for selected organic meat products depending on the sales channel in 2009.

Prices of selected organic meat products in 2009 (in €/kg)					
	Organic pork cutlet	**Organic roast beef**	**Organic ground beef**	**Organic ground pork**	**Organic beef/pork minced meat**
Food retailing	11.83	10.02	8.07	7.33	8.53
Discount stores	n.a.	n.a.	5.62	n.a.	6.90
Specialist shops	12.39	12.07	9.38	8.54	9.72
Average	12.22	12.03	9.01	8.56	8.52

Table 3: Prices of various organic meat products in selected retail channels in 2009
Source: Adapted from Statista, 2014b

Consumer prices of organic meat differed by around €1.30 considering organic meat bought in food retailing versus organic meat bought in specialist shops. Table 3 further shows that consumer prices of organic minced meat are lower than those of pork cutlets and roast beef. In 2009, the average consumer price of one kilogram of conventional roast beef was €7.67. The price of conventionally produced pork cutlets in 2009 amounted to €6.51 per kg (BMEL, 2014c). Comparing these prices to the ones for the corresponding organic meat products (see Table 3), consumers paid on average €4.36 more for one kilogram of organically produced beef and €5.71 for one kilogram of organic pork. The comparably higher amount spent for organic pork could be a result of the lower production of organic pork, compared to organic beef. For organic broiler consumers paid on average €5.00 per kg (Enzler and Schiebel, 2013).

TNS Emnid conducted a survey on behalf of the BMELV in May 2013, asking 1,002 consumers in Germany about various aspects of organic products. According to this study, German consumers have bought organically produced fruit and vegetables the most, followed by eggs, potatoes, milk products, bread and pastries, non-alcoholic beverages, meat and meat products, dry goods (flour, rice, pasta), fish, confectionary, baby food, and alcoholic beverages

(Bundesprogramm Ökologischer Landbau und andere Formen nachhaltiger Landwirtschaft (BÖLN), 2013). Organic meat and meat products thus seem to be of medium importance to German consumers compared to other organic products. The top three reasons for buying organic products as revealed by the survey were: supporting regional businesses, species-appropriate husbandry and lowering pollution (BÖLN, 2013).

Despite a growing demand for organic meat over the past years, it is still a **niche product** in Germany, mainly due to higher consumer prices as pointed out above. A further reason is the comparably lower amount of meat being consumed by people who buy organic products, compared to meat consumed by people who do not buy organic products (Hoffmann and Spiller, 2010).

5 Discussion of the Findings and Conclusion

It was argued in the previous chapters that a decreasing consumption of meat could be seen as in indication for sustainable consumption in the German meat market due to the problems that arise from the (excessive) consumption of meat. In Chapter 4, past data was taken to assess the status quo of meat consumption in Germany and by conducting a regression analysis, a forecast about a possible development of meat consumption in Germany was made.

Since the 1950s the consumption of meat in Germany increased four times until 2012, but decreased slightly since the late 1980s. Using the results obtained by the regression model based on data from 1995 to 2012 on the **per capita consumption of meat**, led to a predicted actual consumption of meat by humans of 58.2 kg carcass weight per person in 2025. This would be less than the consumption in 2012, but it is unlikely that the consumption of meat would decrease to the level recommended by the DGE, which would be between 15.6 kg and 31.2 kg per person per year. Considering this, it can be said that there is **no trend towards sustainable consumption in the German meat market**.

Based on information given by the EEA, a further argument was put forward that could indicate sustainable consumption in Germany, which focuses on the **various types of meat** being consumed by people. To a certain extent, a shift towards consuming more pork and poultry at the expense of consuming less beef could be seen as an indication for sustainable consumption in the German meat market (see Chapter 4.2).

The regression analysis conducted on the per capita **consumption of beef** in Germany did not allow drawing clear conclusions. Using data from 1995 to 2012 indicated that the per capita consumption of beef would decrease until 2025. But if the time frame is shifted from 2002 to 2012, the fluctuation in the consumption of beef decreased, indicating an interruption in the data. This had an effect on the forecast based on data since 2002; it showed a slight increase of the per capita beef consumption until 2025 (see Chapter 4.2). It should be noted, that both models were not statistically firm, thus the predicted values cannot be considered as being reliable. If it is assumed, however, that the consumption follows the pattern of the past ten years, an increase of the per capita consumption of beef would be more likely than a decrease.

The **consumption of pork** also decreased between 1995 and 2012 by 4.0%, but it barely fluctuated over that period (see Chapter 4.2). Taking data since 2002 and thus ignoring the scandals and their possible effects on pork consumption, indicates an even smaller fluctuation with a coefficient of variation amounting to 1.18%. Whether the slight decrease of the per capita consumption of pork will continue in the future, could not be said by using the least

square regression model. It can only be concluded that the consumption of pork has been fairly stable over the past 18 years, with scandals having a minor effect on the consumption.

Compared to beef and pork, no ethical or religious reservations are connected to the **consumption of poultry**. This could be one reason for the increase of the consumption of poultry in Germany from 1995 to 2012 by 38.3% per person. Further reasons for the increase in poultry consumption could be that it is comparably cheaper than beef and pork, it is connected to positive health aspects, and it is fairly easy to prepare (see Chapter 4.2). Bird flu led to a decrease in poultry consumption from 2005 to 2006, but in 2007 the consumption was nearly as high as it was in 2004. BSE could have even had a positive effect on the consumption of poultry, as it increased from 1999 to 2001. People might have thus shifted from beef to poultry due to BSE. This could indicate that health considerations rather than environmental concerns influence consumer's behavior. Using data from 2002 to 2012 for predicting the consumption of poultry until 2025 indicated that there could be an increase of 14.0% per person (see Chapter 4.2). But due to the small sample size, this value should be considered with care.

The findings on the consumption of beef and poultry do not allow drawing clear conclusions about a possible shift from consuming less beef to consuming more poultry in the future. Whether this would be an indication for sustainable consumption in Germany, as pointed out above, remains to be questioned. First, because an increasing demand for poultry is quite likely to result in an increase of the industrial production of poultry. Several negative effects of industrial production have been discussed in Chapter 3.2. And secondly, there seems to be a trend in Germany to consuming parts rather than consuming a whole chicken (see Chapter 4.2). One implication of this could be that the exports of those chicken parts that are not consumed in Germany, but shipped to Africa instead could increase in the future. The negative consequences of these exports have been discussed in Chapter 3.2. Considering these factors, a shift towards consuming more poultry can thus be questioned as an indication for sustainable consumption. This implies that **based on the various types of meat, no statement can be made about a possible trend towards sustainable consumption in the German meat market**.

The **market for organic meat** (see Chapter 4.3) focused on organically certified meat to assess the past development and the potential for certified products, in order to draw further conclusions on sustainable consumption in the German meat market. The development of sales for organic meat could not be assessed due to a lack of data. But the production of organic meat grew over the past years. This can partly be explained by an increasing demand for organic meat.

The transportation of live animals has been mentioned in Chapter 3.2 as a further problem occurring in the meat market. In Germany, however, **regulations** on the transportation of live animals have been put into place as a result of **civic engagement** of German citizens and non-governmental organizations (Deutscher Tierschutzbund, 2012). The “Deutsche Tierschutzlabel” is another example for the outcome of civic engagement in the area of animal welfare (Heinze and Söltl, 2013; Bundschuh and Heinze, 2013). This indicates sustainable consumption in the German meat market, as civic engagement is one character trait of the responsible consumer defined in Chapter 2.2. A trend towards sustainable consumption in the German meat market would occur, if the market share of these certified products would increase in the future. This depends, amongst others, on the willingness of consumers to pay higher prices for certified products, which can be questioned due to the price sensitivity of German consumers.

The **price sensitivity** of German consumers can be reflected by the sales channels used for buying meat. It has been found that organic meat, and also conventional meat, is mainly bought in supermarkets and discount stores. Due to an increasing demand for organic meat, nearly all conventional supermarket chains offer organic meat now. Consumer prices of selected types of organic meat have been found to be cheaper in supermarkets and especially discount stores, as compared to organic meat bought in specialist shops (see Chapter 4.3). The price sensitivity of German consumers could be a possible explanation for organic meat remaining a **niche product**, despite the growing demand for organic products in the past. One major reason for this is the comparably low frequency with which German consumers that buy organic products have purchased organic meat. This is partly due to the type of consumer who purchases organic products, which has been found to generally consume only small amounts of meat, especially when compared to consumers who do not buy organic products (see Chapter 4.3). This also indicates that it is unlikely that the demand for organic meat will rise in the future. The relationship between the type of consumer who buys organic products and the lower frequency of meat purchases could be analyzed in further research, as it is likely to reveal a greater insight into consumer behavior in the context of sustainability.

The development of prices in the future is furthermore likely to affect the market for organic meat, but also the total German meat market. As has been pointed out in Chapter 4.1, consumers in Germany pay attention to various factors when buying meat. A **reasonable and affordable price** is of great importance to consumers. This could be one possible reason for consumers mainly buying meat and meat products in discount stores and supermarkets. But also for the decreasing consumption of meat since the 1990s as it has been found that prices of meat increased on average by 27.5% from 1995 to 2012 (Statistisches Bundesamt, 2014).

The **abstinence of GM feed** is also important to German consumers, thus possibly explaining the growth of organic meat production in Germany. **Traceability** of meat and meat product is a

further criterion considered important by German consumers when buying meat. This is partly reflected by the possibility to state the country of origin on organic products (Enzel and Cypzirsch, 2012). Supporting regional businesses was mentioned as a top priority of German consumers when buying organic products (see Chapter 4.3). Stating the origin of organic meat could thus influence the development of organic meat in the future in a positive way.

The study conducted by the GfK has further found that **certification**, such as animal welfare certified, organically certified, or environment/climate certified, are considered to a lesser extent by German consumers when purchasing meat (see Chapter 4.1). This is a possible explanation for the low market share of such products and could also limit the growth of these types of meat in Germany in the future. Of minor importance to consumers when buying meat, are a **low fat content** and the **easiness to prepare** the meat. But since consumers consider it in their purchasing decision, it could explain why the consumption of poultry has increased. A **rebate** on the product is another factor considered by consumers when purchasing meat. Even though it was not a top priority, it again reflects the importance of price for consumers in Germany when purchasing meat. Prices thus help to understand the development of the consumption of meat in general and of the different types of meat and are likely to influence consumption in the future. Further research could thus consider the effects that price changes had and might have on consumer behavior in the past and in the future.

The study conducted by the GfK revealed that **taste** is the top priority of German consumers when purchasing meat (see Chapter 4.1). This could explain why a trend towards less consumption of meat in Germany is very unlikely to happen.

What can thus be concluded from the analysis? The consumption of meat in Germany is mainly dependent on **consumer prices** of meat and meat products and is likely to decrease when animal diseases or scandals are being spread. Prices for consumers could increase, if **animal welfare requirements and standards on environmentalism** set by the EU or the German government, were to become stricter in the future. This could result in a lower consumption of meat. Whether this is done and to what extent, however, is difficult to determine. On the one hand, the agricultural, slaughtering and meat processing industry is an important employer in Germany, and stricter regulations leading to higher production costs could have negative influences on the competitiveness (BMEL, 2014f). On the other hand, a proceeding climate change, further environmental pressures and occurring animal diseases might require stricter regulations. In fact, some regulations have changed in 2014, due to these factors (BMEL, 2013).

For future research concerning sustainable consumption in the German meat market, further current trends need to be considered. These include, amongst others, the amount of people who shift to a vegetarian or vegan diet and the role of research and development in the meat

sector – especially concerning possible meat substitutes, such as products based on soy, seitan or lupine that are used to create “meat-like” products or the production of in-vitro meat (Verbraucherzentrale Hamburg, 2014; ARTE G.E.I.E, 2014). Taking these factors and analyzing the role of the government in the German meat market would reveal a greater insight into the development of sustainable consumption within this sector. Considering the results obtained in this paper, it can be said that the German meat market has been found to be very complex and no clear conclusions can be drawn about the future consumption of meat in Germany. This makes it difficult to evaluate a possible trend towards sustainable consumption in the German meat market.

List of References

Ahaus, B., Heidbrink, L. and Schmidt, I., 2011. *Der verantwortliche Konsument: Wie Verbraucher mehr Verantwortung in ihren Alltagskonsum übernehmen können.* [pdf] Essen: Center for Responsibility Research. Available at: http://www.responsibility-research.de/resources/WP_10_Der_verantwortliche_Konsument+_.pdf [Accessed 22 October 2014].

ARTE G.E.I.E, 2014. *In-vitro Fleisch - Nahrungsmittel der Zukunft?* [online] Available at: http://future.arte.tv/de/thema/vitro-fleisch [Accessed 25 October 2014].

Balderjahn, I., 2013. *Nachhaltigkeit aus Konsumentensicht – Nachhaltiger Konsum – Vortrag auf der Schmalenbach-Tagung 2013.* [pdf] Available at: https://www.uni-potsdam.de/marketing_ls/dmdocuments/Praxis%20und%20Projekte/Vortraege/Balderjahn/Rechnet%20sich%20nachhaltiger%20Konsum%20Ingo%20Balderjahn.pdf [Accessed 22 October 2014].

Bartz, D., 2013. Eine kurze Geschichte des Nein. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2013*. [pdf]. Berlin. Available at: http://www.bund.net/themen_und_projekte/landwirtschaft/service/materialien/fleischatlas/2013/ [Accessed 23 October 2014].

Belz, F. and Pobisch, J., 2005. *Shared responsibility for sustainable consumption: the case of German food companies*. Freising: Technische Universität München.

Belz, F.-M. and Bilharz, M., 2005. *Nachhaltiger Konsum: Zentrale Herausforderung für Moderne Verbraucherpolitik*. Freising: Technische Universität München.

Belz, F.-M. and Bilharz, M., 2007. Nachhaltiger Konsum, geteilte Verantwortung und Verbraucherpolitik. In: F.-M. Belz, G. Karg, and D. Witt. *Nachhaltiger Konsum und Verbraucherpolitik im 21. Jahrhundert*. Marburg: Metropolis Verlag, pp. 21-52.

Benning, R., 2013. Stille Subventionen, verdeckte Kosten, offene Rechnungen. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2013*. [pdf]. Berlin. Available at: http://www.bund.net/themen_und_projekte/landwirtschaft/service/materialien/fleischatlas/2013/ [Accessed 23 October 2014].

Benning, R., 2014. Hormone – der Kampf um das Nein. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2014*. [pdf]. Berlin. Available at: http://www.bund.net/fleischatlas [Accessed 23 October 2014].

Berenson, M. L., Levine, D. M. and Krehbiel, T. C., 2009. Basic business statistics: concepts and applications. 11th ed. Upper Saddle River: Pearson Prentice Hall.

Birkel, K., 2013. Tiermedikamente machen krank. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2013*. [pdf]. Berlin. Available at: http://www.bund.net/themen_und_projekte/landwirtschaft/service/materialien/fleischatlas/2013/ [Accessed 23 October 2014].

BLE, 2013. *Quartalsbericht zur Nutzung des Bio-Siegels Dezember 2013.* [pdf] Available at: http://www.bmel.de/SharedDocs/Downloads/Landwirtschaft/OekologischerLandbau/QuartalsberichtDezember2013.pdf?__blob=publicationFile [Accessed 23 October 2014].

BMEL, 2001. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten der Bundesrepublik Deutschland 2001.* [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/ [Accessed 23 October 2014].

BMEL, 2005. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten der Bundesrepublik Deutschland 2005.* [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/ [Accessed 23 October 2014].

BMEL, 2006. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten der Bundesrepublik Deutschland 2006.* [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/ [Accessed 23 October 2014].

BMEL, 2007. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten der Bundesrepublik Deutschland 2007.* [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/ [Accessed 23 October 2014].

BMEL, 2008. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten der Bundesrepublik Deutschland 2008.* [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/ [Accessed 23 October 2014].

BMEL, 2009. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten der Bundesrepublik Deutschland 2009.* [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/ [Accessed 23 October 2014].

BMEL, 2010. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten der Bundesrepublik Deutschland 2010.* [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/ [Accessed 23 October 2014].

BMEL, 2011. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten der Bundesrepublik Deutschland 2011.* [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/ [Accessed 23 October 2014].

BMEL, 2012. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten der Bundesrepublik Deutschland 2012.* [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/ [Accessed 23 October 2014].

BMEL, 2013. *Ernährung, Landwirtschaft und Verbraucherschutz: Was sich im Jahr 2014 ändert.* [online] Available at: http://www.bmelv.de/SharedDocs/Pressemitteilungen/2013/304-Was-sich-2014-aendert.html [Accessed 23 October 2014].

BMEL, 2014a. *Bio-Siegel.* [online] Available at: http://www.bmel.de/DE/Landwirtschaft/Nachhaltige-Landnutzung/Oekolandbau/_Texte/Bio-Siegel.html [Accessed 23 October 2014].

BMEL, 2014b. Durchschnittlicher Verzehr ausgewählter Lebensmittelgruppen nach Geschlecht und Altersgruppen. (4010900). In: Bundesministerium für Ernährung und Landwirtschaft. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten 2013*. [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/kap-d-ernaehrungsw/ [Accessed 23 October 2014].

BMEL, 2014c. Entwicklung der Verbraucherpreise für ausgewählte Nahrungsmittel. (5050850). In: Bundesministerium für Ernährung und Landwirtschaft. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten 2013*. [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/kap-d-ernaehrungsw/ [Accessed 23 October 2014].

BMEL, 2014d. Kaufkraft des Stundenlohnes eines Industriearbeiters bei einzelnen Nahrungsmitteln. (5050900). In: Bundesministerium für Ernährung und Landwirtschaft. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten 2013*. [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/kap-d-ernaehrungsw/ [Accessed 23 October 2014].

BMEL, 2014e. *Ökologischer Landbau in Deutschland.* [online] Available at: http://www.bmel.de/DE/Landwirtschaft/Nachhaltige-Landnutzung/Oekolandbau/_Texte/OekologischerLandbauDeutschland.html;jsessionid=B321C31320700FAA2A4DBFE944CA9B47.2_cid296 [Accessed 23 October 2014].

BMEL, 2014f. Umsatz der Betriebe des Produzierenden Ernährungsgewerbes. (4100900). In: Bundesministerium für Ernährung und Landwirtschaft. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten 2013*. [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/kap-d-ernaehrungsw/ [Accessed 23 October 2014].

BMEL, 2014g. Verkaufserlöse der Landwirtschaft nach Erzeugnissen (3130200). In: Bundesministerium für Ernährung und Landwirtschaft. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten 2013*. [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/kap-d-ernaehrungsw/ [Accessed 23 October 2014].

BMEL, 2014h. Versorgung mit Fleisch nach Fleischarten. (4050700) In: Bundesministerium für Ernährung und Landwirtschaft. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten 2013*. [pdf] Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/kap-d-ernaehrungsw/ [Accessed 23 October 2014].

BMEL, n.d. *EU-Bio-Logo ergänzt verpflichtend das deutsche Bio-Siegel.* [online] Available at: http://www.bmel.de/DE/Landwirtschaft/Nachhaltige-Landnutzung/Oekolandbau/_Texte/EU-Bio-Logo.html [Accessed 23 October 2014].

BMELV ed., 2009. *Die deutsche Landwirtschaft – Leistungen in Daten und Fakten.* [pdf] Available at: http://www.bmelv.de/cae/servlet/contentblob/430138/publicationFile/26477/DieDeutscheLandwirtschaft.pdf [Accessed 23 October 2014].

BÖLN, 2013. *Ökobarometer 2013.* [pdf] Available at: http://www.bmel.de/SharedDocs/Downloads/Ernaehrung/Oekobarometer_2013.pdf?__blob=publicationFile [Accessed 23 October 2014].

BÖLW ed., 2013. Zahlen, Daten, Fakten: Die Bio-Branche 2013. [pdf] Berlin: Bund Ökologische Lebensmittelwirtschaft. Available at: http://www.boelw.de/zahlendatenfakten.html#c2744 [Accessed 23 October 2014].

BÖLW ed., 2014. Zahlen, Daten, Fakten: Die Bio-Branche 2014. [pdf] Berlin: Bund Ökologische Lebensmittelwirtschaft. Available at: http://www.boelw.de/zahlendatenfakten.html#c2744 [Accessed 23 October 2014].

Bundesministerium für Ernährung, Landwirtschaft und Forsten, 1956. Statistisches Handbuch über Landwirtschaft und Ernährung der Bundesrepublik Deutschland. [pdf] Hamburg und Berlin: Paul Parey. Available at: http://www.bmelv-statistik.de/de/statistisches-jahrbuch/ [Accessed 23 October 2014].

Bundesverband Verbraucherzentrale, 2011. *Lebensmittelskandale in Deutschland – von BSE bis Dioxin.* [pdf] Available at: http://www.vzbv.de/mediapics/lebensmittelskandale_2000_bis_2010.pdf [Accessed 23 October 2014].

Bundschuh, R. and Heinze, C., 2013. Eier und Geflügel. In: Landesanstalt für Entwicklung der Landwirtschaft und der Ländlichen Räume and Bayerische Landesanstalt für Landwirtschaft (eds.). *Agrarmärkte 2013*. [pdf] Available at: http://www.lfl.bayern.de/publikationen/schriftenreihe/044949/index.php [Accessed 23 October 2014].

Carlowitz, H. C., 2009. *Sylvicultura oeconomica. Hausswirthliche Nachricht und naturmässige Anweisung zur wilden Baum-Zucht*. Reprint of 2. ed. Leipzig, Braun, 1732. Remagen-Oberwinter: Kessel.

Chemnitz, C., 2013. Futtermittel für Milliarden. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2013*. [pdf]. Berlin. Available at: http://www.bund.net/themen_und_projekte/landwirtschaft/service/materialien/fleischatlas/2013/ [Accessed 23 October 2014].

Chemnitz, C., 2014. *Unersättlicher Weltmarkt.* In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2014*. [pdf]. Berlin. Available at: http://www.bund.net/fleischatlas [Accessed 23 October 2014].

Clement, R., Kiy, M. and Terlau, W., 2014. Nachhaltigkeitsökonomie: Grundlagen und Fallbeispiele zur ökonomischen, ökologischen und sozialen Dimension der Nachhaltigkeit. In: Pepels, W. ed. *Management Basics – BWL für Studium und Karriere*. Berlin: Berliner Wissenschafts-Verlag, Band 17.

Clement, R., Terlau, W. and Kiy, M., 2013. *Angewandte Makroökonomie: Makroökonomie, Wirtschaftspolitik und nachhaltige Entwicklung mit Fallbeispielen*. 5th ed. München: Vahlen Verlag.

Commission of the European Communities (2008) *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan.* (COM(2008)367final). [online] Brussels. Available at: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52008DC0397 [Accessed 22 October 2014].

Cordts, A., Spiller, A., Nitzko, S., Grethe, H. and Duman, N., 2013. Imageprobleme beeinflussen den Konsum – Von unbekümmerten Fleischessern, Flexitariern, und (Lebensabschnitts-)Vegetariern. [pdf] Available at: http://www.lebensmittelzeitung.net/studien/pdfs/571_.pdf [Accessed 23 October 2014].

Crane, A. and Matten, D., 2010. *Business ethics: Managing Corporate Citizenship and Sustainability in the Age of Globalization*. 3rd ed. New York: Oxford University Press.

Deutscher Bundestag, 2013. *Schlussbericht der Enquete-Kommission „Wachstum, Wohlstand, Lebensqualität – Wege zu nachhaltigem Wirtschaften und gesellschaftlichem Fortschritt in der Sozialen Marktwirtschaft“*. (Drucksache 17/13300). [pdf] Bonn: Deutscher Bundestag. Available at: http://www.bpb.de/shop/buecher/schriftenreihe/175745/schlussbericht-der-enquete-kommission [Accessed 22 October 2014].

Deutscher Fleischer-Verband, 2014a. *Auszüge aus dem Geschäftsbericht – Fleischverzehr.* [pdf] Available at: http://www.fleischerhandwerk.de/medien--und-presseservice/daten-und-fakten/geschaeftsbericht/auszge-aus-dem-geschaeftsbericht.html [Accessed 23 October 2014].

Deutscher Fleischer-Verband, 2014b. *Auszüge aus dem Geschäftsbericht – Versorgungslage bei Vieh und Fleisch.* [pdf] Available at: http://www.fleischerhandwerk.de/medien--und-presseservice/daten-und-fakten/geschaeftsbericht/auszge-aus-dem-geschaeftsbericht.html [Accessed 23 October 2014].

Deutscher Tierschutzbund, 2012. *Hintergrundinformationen: Tiertransporte.* [pdf] Available at: http://www.tierschutzbund.de/fileadmin/user_upload/Downloads/Hintergrundinformationen/Landwirtschaft/Tiertransporte.pdf [Accessed 23 October 2014].

Deutscher Tierschutzbund, 2013. *Informationen für Verbraucher.* [online] Available at: http://www.tierschutzlabel.info/verbraucher/ [Accessed 23 October 2014].

DGE, 2011. *Nachhaltigkeit in der Ernährung.* [online] Available at: http://www.dge.de/modules.php?name=News&file=article&sid=1189 [Accessed 23 October 2014].

DGE ed., 2012. *12. Ernährungsbericht 2012*. Bonn: Deutsche Gesellschaft für Ernährung.

Die Bundesregierung, 2014. *Die nationale Nachhaltigkeitsstrategie.* [online] Presse- und Informationsamt der Bundesregierung. Available at: http://www.bundesregierung.de/Webs/Breg/DE/Themen/Nachhaltigkeitsstrategie/1-die-nationale-nachhaltigkeitsstrategie/nachhaltigkeitsstrategie/_node.html [Accessed 22 October 2014].

Dirks, H. E., Kaiser, S., Klose, G., Pfeiffer, I. and Backhaus, M., 2010. *Verbrauchermonitoring: Perspektiven der Verbraucher zum Klimaschutz: Mobilität & Ernährung.* [pdf] Berlin: Prognos. Available at: http://www.prognos.com/fileadmin/pdf/publikationsdatenbank/Prognos_Verbrauchermonitoring_Endbericht.pdf [Accessed 22 October 2014].

Dodds, F. Schneeberger, K. and Ullah, F., 2012. *Review of implementation of Agenda 21 and the Rio Principles*. [pdf] United Nations Department of Economic and Social Affairs. Available at: http://www.uncsd2012.org/content/documents/194Synthesis%20Agenda%2021%20and%20Rio%20principles.pdf [Accessed 22 October 2014].

Dusseldorp, M. and Sauter, A., 2011. *Forschung zur Lösung des Welternährungsproblems – Ansatzpunkte, Strategien, Umsetzung.* [pdf] Büro für Technikfolgenabschätzung beim Deutschen Bundestag. Available at: http://www.tab-beim-bundestag.de/de/pdf/publikationen/berichte/TAB-Arbeitsbericht-ab142.pdf [Accessed 22 October 2014].

Eckert, S., Karg, G. and Zängler, T., 2007. Nachhaltiger Konsum aus Sicht der Verbraucher. In: F.-M. Belz, G. Karg, and D. Witt. *Nachhaltiger Konsum und Verbraucherpolitik im 21. Jahrhundert*. Marburg: Metropolis Verlag, pp. 53-78.

EEA, 2010a. Assessing biodiversity in Europe – the 2010 report. [pdf] Copenhagen: European Environment Agency. Available at: http://www.eea.europa.eu/publications/assessing-biodiversity-in-europe-84 [Accessed 22 October 2014].

EEA, 2010b. *The European environment – state and outlook: Water resources: quantities and flows.* [pdf] Copenhagen: European Environment Agency. Available at: http://www.eea.europa.eu/soer/europe/water-resources-quantity-and-flows [Accessed 23 October 2014].

EEA, 2012. *Consumption and the Environment – 2012 update.* [pdf]. Copenhagen: European Environment Agency. Available at: http://www.eea.europa.eu/publications/consumption-and-the-environment-2012 [Accessed 22 October 2014].

EEA, 2013a. *Environmental Indicator Report 2013 - Natural resources and human well-being in a green economy.* [pdf] Luxembourg: Publications Office of the European Union. Available at: http://www.eea.europa.eu/publications/environmental-indicator-report-2013 [Accessed 21 October 2014].

Enzler, J. and Cypzirsch, K., 2012. Bio-/Ökoprodukte. In: Landesanstalt für Entwicklung der Landwirtschaft und der Ländlichen Räume and Bayerische Landesanstalt für Landwirtschaft (eds.). *Agrarmärkte 2011/12*. [pdf] Available at: http://www.lfl.bayern.de/iem/agrarmarkt/027287/index.php [Accessed 23 October 2014].

Enzler, J. and Schiebel, A.-S., 2013. Bio-/Ökoprodukte. In: Landesanstalt für Entwicklung der Landwirtschaft und der Ländlichen Räume and Bayerische Landesanstalt für Landwirtschaft (eds.). *Agrarmärkte 2013*. [pdf] Available at: http://www.lfl.bayern.de/publikationen/schriftenreihe/044949/index.php [Accessed 23 October 2014].

European Commission, 2014. *Logo.* [online] Available at: http://ec.europa.eu/agriculture/organic/downloads/logo/index_de.htm [Accessed 23 October 2014].

European Environmental Bureau, 2014. *Sustainable Development/SCP – What is the EU doing?* [online] Available at: http://www.eeb.org/index.cfm/activities/sustainability/sustainable-development/sustainable-development-what-is-the-eu-doing/ [Accessed 22 October 2014].

European Union (2011) *Sustainable development in the European Union – 2011 monitoring report of the EU sustainable development strategy.* [pdf] Luxembourg: Publications Office of the European Union. Available at: http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=KS-31-11-224 [Accessed 22 October 2014].

FAO, 2006*. Livestock's long shadow.* [pdf] Rome: FAO. Available at: http://www.fao.org/docrep/010/a0701e/a0701e00.HTM [Accessed 23 October 2014].

FAO, 2012. *Sustainable Diets and Biodiversity. Directions and Solutions for Policy, Research and Action.* [pdf] Rome: FAO. Available at: http://www.fao.org/docrep/016/i3004e/i3004e.pdf [Accessed 22 October 2014].

FAO, WFP and IFAD, 2012. *The State of Food Insecurity in the World 2012. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition*. [pdf] Rome: FAO. Available at: http://www.fao.org/docrep/016/i3027e/i3027e.pdf [Accessed 22 October 2014].

GfK, 2012a. *Final Report – Consumer Market Study on the Functioning of the meat market for consumers in the European Union SANCO/2009/B1/010*. [pdf] GfK EU3C. Available at: http://ec.europa.eu/consumers/consumer_evidence/market_studies/meat_market/index_en.htm [Accessed 23 October 2014].

GfK, 2012b. *Introduction to the Country Fact Sheets – Consumer Market Study on the Functioning of the meat market for consumers in the European Union SANCO/2009/B1/010*. [pdf] GfK EU3C. Available at: http://ec.europa.eu/consumers/consumer_evidence/market_studies/meat_market/index_en.htm [Accessed 23 October 2014].

Grunwald, A. and Kopfmüller, J., 2012. *Nachhaltigkeit*. 2nd ed. Frankfurt am Main: Campus Verlag GmbH.

Gura, S., 2013. Artenvielfalt in Gefahr. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2013*. [pdf]. Berlin. Available at: http://www.bund.net/themen_und_projekte/landwirtschaft/service/materialien/fleischatlas/2013/ [Accessed 23 October 2014].

Hauff, M. von and Kleine, A., 2009. Nachhaltige Entwicklung: Grundlagen und Umsetzung. München: Oldenbourg Wissenschaftsverlag GmbH.

Heidbrink, L., Schmidt, I. and Ahaus, B., 2011. Einleitung – Der Konsument zwischen Markt und Moral, In: Heidbrink, L., Schmidt, I. and Ahaus, B. (eds.) Die Verantwortung des Konsumenten: Über das Verhältnis von Markt, Moral und Konsum. Frankfurt am Main: Campus Verlag GmbH, pp. 9-24.

Heinze, C. and Bundschuh, R., 2013. Vieh und Fleisch. In: Landesanstalt für Entwicklung der Landwirtschaft und der Ländlichen Räume and Bayerische Landesanstalt für Landwirtschaft (eds.). *Agrarmärkte 2013*. [pdf] Available at: http://www.lfl.bayern.de/publikationen/schriftenreihe/044949/index.php [Accessed 23 October 2014].

Heinze, C. and Söltl, M., 2013. Schweine. In: Landesanstalt für Entwicklung der Landwirtschaft und der Ländlichen Räume and Bayerische Landesanstalt für Landwirtschaft (eds.). *Agrarmärkte 2013*. [pdf] Available at: http://www.lfl.bayern.de/publikationen/schriftenreihe/044949/index.php [Accessed 23 October 2014].

Hoekstra, A. J., 2012. *The hidden water resource use behind meat and dairy.* [pdf] Available at: http://www.waterfootprint.org/Reports/Hoekstra-2012-Water-Meat-Dairy.pdf [Accessed 23 October 2014].

Hoffmann, I. and Spiller, A. eds., 2010. *Auswertung der Daten der Nationalen Verzehrsstudie II (NVS II): eine integrierte verhaltens- und lebensstilbasierte Analyse des Bio-Konsums.* [pdf] Max Rubner-Institut and Georg-August-Universität Göttingen. Available at: http://orgprints.org/18055/ [Accessed 23 October 2014].

Homburg, A. and Matthies, E., 2010. Nachhaltiger Konsum – Einführung zum Themenschwerpunkt. *Umweltpsychologie*, 14(2), pp. 4-9.

Hudson, U. and Petrini, C., 2014. Gute Lebensmittel gesucht. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2014*. [pdf]. Berlin. Available at: http://www.bund.net/fleischatlas [Accessed 23 October 2014].

Humboldt Forum for Food and Agriculture (2009) *World Food Security*. [online] Available at: http://www.hffa.info/index.php/press/archive/2009/20090903-world-food.html [Accessed 22 October 2014].

Institut der deutschen Wirtschaft, n.d. *Kaufkraft der Nettoverdienste.* [online] Available at: http://www.iwkoeln.de/de/infodienste/iw-dossiers/kapitel/einkommen-kaufkraft/beitrag/kaufkraft-der-nettoverdienste-20280 [Accessed 23 October 2014].

Kalverkamp, M. A., 2014. Argentinien, das Soja-Reich. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2014*. [pdf]. Berlin. Available at: http://www.bund.net/fleischatlas [Accessed 23 October 2014].

Kleine, A., 2009. Operationalisierung einer Nachhaltigkeitstrategie: Ökologie, Ökonomie und Soziales integrieren. Wiesbaden: Gabler | GWV Fachverlage GmbH.

König, 2013. *Kleine Geschichte der Konsumgesellschaft: Konsum als Lebensform der Moderne*. 2nd ed. Stuttgart: Steiner Franz Verlag.

Kotler, P., Armstrong, G., Wong, V., Saunders, J., 2011. *Grundlagen des Marketing*. München: Pearson Deutschland GmbH.

Kranert, M., Hafner, G., Barabosz, J., Schuller, H., Leverenz, D., Kölbig, A., Schneider, F., Lebersorger, S. and Scherhaufer, S., 2012. *Ermittlung der weggeworfenen Lebensmittelmengen und Vorschläge zur Verminderung der Wegwerfrate bei Lebensmitteln in Deutschland*. [pdf] Stuttgart: Universität Stuttgart. Available at: http://www.bmel.de/SharedDocs/Downloads/Ernaehrung/WvL/Studie_Lebensmittelabfaelle_Langfassung.pdf?__blob=publicationFile [Accessed 23 October 2014].

Krausmann, F., Gingrich, S., Eisenmenger, N., Erb, K.H., Haberl, H., Fischer-Kowalski, M., 2009. Growth in global materials use, GDP and population during the 20th century. [pdf] Available at: http://www.uni-klu.ac.at/socec/inhalt/3932.htm [Accessed 24 October 2014].

Kriener, M., 2013a. Deutsche Konsumenten zwischen Massenware, Bio und Entsagung. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2013*. [pdf]. Berlin. Available at: http://www.bund.net/themen_und_projekte/landwirtschaft/service/materialien/fleischatlas/2013/ [Accessed 23 October 2014].

Kriener, M., 2013b. Ein Schlag ins Wasser. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2013*. [pdf]. Berlin. Available at: http://www.bund.net/themen_und_projekte/landwirtschaft/service/materialien/fleischatlas/2013/ [Accessed 23 October 2014].

Mari, F., 2013. Westafrikanische Krisen durch Europas Hühnerfleisch-Reste. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2013*. [pdf]. Berlin. Available at: http://www.bund.net/themen_und_projekte/landwirtschaft/service/materialien/fleischatlas/2013/ [Accessed 23 October 2014].

Max Rubner-Institut, n.d. *Nationales Ernährungsmonitoring.* [online] Available at: http://www.mri.bund.de/no_cache/de/institute/ernaehrungsverhalten/forschungsprojekte/nationales-ernaehrungsmonitoring.html [Accessed 23 October 2014].

Meyer, R., Sauter, A. and Kassam, A., 2011. Feeding the World: Challenges and Opportunities. *Technikfolgenabschätzung – Theorie und Praxis*, [e-journal], 20(2), pp. 5-13. Available through: Karlsruher Institut für Technologie http://www.tatup-journal.de/schwerpunktthemen.php [Accessed 22 October 2014].

Micklitz, H.-W., Oehler, A., Piorkowsky, M.-B., Reisch, L.A. and Strünck, C., 2010. *Der vertrauende, der verletzliche oder der verantwortungsvolle Verbraucher? Plädoyer für eine differenzierte Strategie in der Verbraucherpolitik.* [pdf] Available at: http://www.bmelv.de/SharedDocs/Downloads/Ministerium/Beiraete/Verbraucherpolitik/2010_12_StrategieVerbraucherpolitik.pdf [Accessed 22 October 2014].

Moldenhauer, H., 2014. Schnitzel, Würsten, Glyphosat. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2014*. [pdf]. Berlin. Available at: http://www.bund.net/fleischatlas [Accessed 23 October 2014].

OECD, 1997. Sustainable consumption and production. Paris: Organisation for Economic Co-operation and Development.

OECD/FAO, 2013. *OECD-FAO Agricultural Outlook 2013.* [pdf] Available at: http://www.oecd-ilibrary.org/agriculture-and-food/oecd-fao-agricultural-outlook-2013_agr_outlook-2013-en [Accessed 23 October 2014].

Otte, J., Roland-Holst, D., Pfeiffer, D., Soares-Magalhaes, R., Rushton, J., Graham, J. and Silbergeld, E., 2007. *Industrial Livestock Production and Global Health Risks.* [pdf] Available at: http://www.fao.org/ag/againfo/programmes/en/pplpi/docarc/rep-hpai_industrialisationrisks.pdf [Accessed 23 October 2014].

Piorkowsky, M.-B., 2001. Sub-Paradigmen des Nachhaltigkeitsparadigmas. In: U. Schrader and U. Hansen (eds.) *Nachhaltiger Konsum: Forschung und Praxis im Dialog.* Frankfurt/Main: Campus Verlag GmbH, pp. 49-62.

Pufé, I., 2012. Nachhaltigkeit. Konstanz: UVK Verlagsgesellschaft mbH.

Reisch, L. A. and Scherhorn, G., 1998. Auf der Suche nach dem ethischen Konsum – Nachhaltigkeit, Lebensstile und Konsumentenverhalten. *Der Bürger im Staat,* 48(2), pp. 92-99.

Roscher, M., 2012. Tierschutz- und Tierrechtsbewegung – ein historischer Abriss. [online] Available at: http://www.bpb.de/apuz/75820/tierschutz-und-tierrechtsbewegung-ein-historischer-abriss?p=all [Accessed 23 October 2014].

Schoenheit, I. and Schudak, A., 2013. *Abschlussbericht – Indikatoren für Nachhaltigen Konsum*. [pdf] Hannover: Institut für Markt-Umwelt-Gesellschaft. Available at: http://download.ble.de/12HS019/12HS019.pdf [Accessed 21 October 2014].

Schrader, U. and Hansen, U., 2001. Nachhaltiger Konsum – Leerformel oder Leitprinzip? In: U. Schrader and U. Hansen eds., *Nachhaltiger Konsum: Forschung und Praxis im Dialog.* Frankfurt/Main: Campus Verlag GmbH, pp. 17-48.

Sebastian, M., 2014. In den Schlachthöfen der Welt. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2014*. [pdf]. Berlin. Available at: http://www.bund.net/fleischatlas [Accessed 23 October 2014].

Statista, 2014a. Einkauf von Biolebensmitteln in Deutschland – Statista Dossier 2014. [ppt] Available at: http://de.statista.com/statistik/studie/id/6481/dokument/konsum-von-bio-und-naturprodukten--statista-dossier/ [Accessed 23 October 2014].

Statista, 2014b. *Preisvergleich ausgewählter Bio-Fleischprodukte nach Geschäftstypen im Jahr 2009.* [online] Available at: http://de.statista.com/statistik/daten/studie/151858/umfrage/preisvergleich-von-bio-fleischprodukte-nach-geschaeftstypen-im-jahr-2009/ [Accessed 23 October 2014].

Statista, 2014c. *Warum kaufen Sie nicht häufiger nachhaltige Produkte?* [online] Available at: http://de.statista.com/statistik/daten/studie/208136/umfrage/einstellung-der-verbraucher-zum-kauf-nachhaltiger-produkte/ [Accessed 23 October 2014].

Statistisches Bundesamt, 2008. *Vom Erzeuger zum Verbraucher – Fleischversorgung in Deutschland. Ausgabe 2008.* [pdf] Wiesbaden: Statistisches Bundesamt. Available at: https://www.destatis.de/DE/Publikationen/Thematisch/LandForstwirtschaft/ViehbestandTierischeErzeugung/Fleischversorgung.html [Accessed 23 October 2014].

Statistisches Bundesamt, 2013. *Geflügel 2012.* [pdf] Wiesbaden: Statistisches Bundesamt. Available at: https://www.destatis.de/DE/Publikationen/Thematisch/LandForstwirtschaft/ViehbestandTierischeErzeugung/Gefluegel.html [Accessed 23 October 2014].

Statistisches Bundesamt, 2014. *Verbraucherpreisindex: Deutschland, Jahre, Klassifikation der Verwendungszwecke des Individualkonsum. (61111-0003).* [online] GENESIS. Available at: https://www-genesis.destatis.de/genesis/online/logon [Accessed 23 October 2014].

Strange, T. and Bayley, A., 2008. Sustainable Development: Linking economy, society, environment. [pdf] OECD. Available at: http://www.worldresourcesforum.org/files/file/Full%20book.pdf [Accessed 22 October 2014].

Tremmel, J., 2003. *Nachhaltigkeit als politische und analytische Kategorie: Der deutsche Diskurs um nachhaltige Entwicklung im Spiegel der Interessen der Akteure*. München: oekom Verlag.

Tully, C. J., 2012. *Nachhaltiger Konsum.* [online] Bonn: Bundeszentrale für politische Bildung. Available at: http://www.bpb.de/apuz/139202/nachhaltiger-konsum?p=0 [Accessed 22 October 2014].

UN, 1992. *Agenda 21*. [pdf] United Nations Division for Sustainable Development. Available at: http://sustainabledevelopment.un.org/content/documents/Agenda21.pdf [Accessed 22 October 2014].

UN, 1997. *UN Conference on Environment and Development (1992).* [online] Available at: http://www.un.org/geninfo/bp/enviro.html [Accessed 22 October 2014].

UN, 2010. *Trends in sustainable development - Towards sustainable consumption and production*. [pdf] New York: United Nations. Available at: http://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=15&menu=1572 [Accessed 21 October 2014].

UN, 2012. *Resolution adopted by the General Assembly on 27 July 2012.* (A/RES/66/288). United Nations. [online] Available at: http://www.un.org/en/ga/66/resolutions.shtml [Accessed 22 October 2014].

UN, n.d. *United Nations Conference on Sustainable Development, Rio+20.* [online] United Nations Department of Economic and Social Affairs, Division for Sustainable Development. Available at: http://sustainabledevelopment.un.org/rio20.html [Accessed 22 October 2014].

UNEP, 2007. *GEO-4 Global Environment Outlook – Environment for development.* [pdf] Malta: United Nations Environment Programme. Available at: http://www.unep.org/geo/geo4.asp [Accessed 21 October 2014].

UNEP, 2010. *ABC of SCP: Clarifying Concepts on Sustainable Consumption and Production.* [pdf] United Nations Environment Programme. Available at: http://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=945&menu=35 [Accessed 22 October 2014].

UNEP, 2011. *Paving the way for Sustainable Consumption and Production: The Marrakesh Process Progress Report*. [pdf] United Nations Environment Programme. Available at: http://www.unep.fr/scp/marrakech/ [Accessed 22 October 2014].

UNEP, 2012. *GEO-5 Global Environment Outlook – Environment for the future we want.* [pdf] Malta: United Nations Environment Programme. Available at: http://www.unep.org/geo/geo5.asp [Accessed 21 October 2014].

Verbraucherzentrale Hamburg, 2014. *Pflanze statt Fleisch: Soja, Leinen und Lupineprodukte im Check.* [pdf] Available at: http://www.vzhh.de/ernaehrung/334691/Vegan_Fleischersatzprodukte_vzhh.pdf [Accessed 25 October 2014].

Verbraucherzentrale NRW, 2014. *Thesenpapier – Der verantwortungsvolle Verbraucher: Aspekte des ethischen, nachhaltigen und politischen Konsums*. [pdf] Available at: http://www.vz-nrw.de/5-kvf-ws [Accessed 22 October 2014].

Vogt, M., 2009. *Prinzip Nachhaltigkeit: Ein Entwurf aus theologisch-ethischer Perspektive.* München: oekom Verlag.

WBCSD, 2008. *Sustainable consumption facts & trends: From a business perspective.* [pdf] World Business Council on Sustainable Development. Available at: http://www.wbcsd.org/pages/edocument/edocumentdetails.aspx?id=142 [Accessed 21 October 2014].

WBCSD, 2010. *Vision 2050 – The new agenda for business.* [pdf] World Business Council on Sustainable Development. Available at: http://www.wbcsd.org/pages/edocument/edocumentdetails.aspx?id=219&nosearchcontextkey=true [Accessed 21 October 2014].

Weber, C., 2001. Nachhaltiger Konsum – Versuch einer Einordnung und Operationalisierung. In: U. Schrader and U. Hansen (eds.) *Nachhaltiger Konsum: Forschung und Praxis im Dialog.* Frankfurt/Main: Campus Verlag GmbH, pp. 63-76.

Weidema, B. P., Wesnæs, M. Hermansen, J., Kristensen, T. and Halberg, N., 2008. *Environmental Improvement Potential of Meat and Dairy Products.* [pdf] Luxembourg: Office for Official Publications of the European Communities. Available at: http://ftp.jrc.es/EURdoc/JRC46650.pdf [Accessed 23 October 2014].

Wetter, K. J., 2014. Eine ganze Handvoll Arten für die ganze Welt. In: Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland (BUND) and Le Monde Diplomatique. *Fleischatlas 2014*. [pdf]. Berlin. Available at: http://www.bund.net/fleischatlas [Accessed 23 October 2014].

Wiedemann, M., 2014. *Unser täglich Fleisch – Tiertransporte in Europa.* [TV documentary] ZDF. May 2014. Available at: http://www.zdf.de/planet-e/unser-taeglich-fleisch-tiertransporte-in-europa-und-was-unser-konsum-dazu-beitraegt-33293612.html [Accessed 23 October 2014].

Wimmer, F., 2001. Forschungsüberlegungen und empirische Ergebnisse zum nachhaltigen Konsum. In: U. Schrader and U. Hansen (eds.) *Nachhaltiger Konsum: Forschung und Praxis im Dialog.* Frankfurt/Main: Campus Verlag GmbH, pp. 77-102.

World Commission on Environment and Development, 1987. *Our Common Future*. Oxford: Oxford University Press.

WWF, 2006. *Living Planet Report 2006*. [pdf] Gland: WWF International. Available at: http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/living_planet_report_timeline/lp_2006/ [Accessed 22 October 2014].

WWF, 2012. *Living Planet Report 2012*. [pdf] Gland: WWF International. Available at: http://www.footprintnetwork.org/images/uploads/LPR_2012.pdf [Accessed 21 October 2014].

WWF, n.d.. *Ist Fleischkonsum Privatsache?* [online] Available at: http://fleischfrage.wwf.de/worum-gehts/fleisch-konsum/ [Accessed 23 October 2014].